MACHINERY

DESIGN — CONSTRUCTION — OPERATION

Volume 40 SEPTEMBER, 1933 Number 1

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MACHINERY

Volume 40 NEW YORK, SEPTEMBER, 1933 Number 1

Ball Bearings Deserve their Reputation for Quality

By CHARLES O. HERB

Throughout the Manufacture of Ball Bearings, Unceasing Efforts are Made to Prevent Rusting, Maintain Cleanliness, and Insure High Standards of Accuracy and Quality

BICYCLES and roller skates gave the first marked impetus to the use of ball bearings. The ball bearings of the early days were crude in comparison with modern types, but even at that time, they were a symbol of high quality in the minds of the general public. To say that a bicycle or a pair of roller skates was "ball bearing" was to give it a stamp of unqualified approval. Ball bearings go back much farther than the bicycle, however. In fact, they were applied industrially by a German crane builder as long ago as 1845, but it was not until the nineties — with the arrival of the bicycle — that ball bearings became important from a commercial viewpoint.

The real development of high-grade ball bearings started with the advent of the automobile, and much credit should be given to the automotive industry for demonstrating the practical possibilities of ball bearings. Today they are used in all types of machines and appliances when quietness of operation, high speed, and long life are desired. Their reputation for superior quality has constantly increased. And small

wonder, as, of the hundreds of mechanical products made to extreme degrees of accuracy—from delicate measuring instruments to huge electric turbo-generators—it would be difficult to point out a product made with greater care than that exercised in almost every step of the manufacture of ball or roller bearings. With the constantly expanding application of ball bearings, there have been great improvements in the materials from which they are made and in the manufacturing and inspection methods employed to insure the desired accuracy and character of finished surfaces.

A trip through a ball bearing factory will reveal extremely close supervision over all phases of manufacture. This article will not attempt to cover the many interesting details of ball bearing production, but will rather emphasize some of the precautions taken at the Philadelphia plant of S K F Industries, Inc., to safeguard the accuracy and quality of the bearings made there.

Rust and dirt are the worst enemies of ball bearings, not only in use, but also during their manufacture. To reduce chances of corrosion, the various parts are sent through the manufacturing operations in as rapid sequence as possible and a thin film of oil is kept on all parts. To provide this oil film and to eliminate dirt, the parts are run through automatic washing machines between the different manufacturing operations, before and after assembly, and also after the final inspection has been completed.

The Bearings are Assembled in a Filtered Atmosphere

Elaborate precautions against dirt are taken in the assembling room, a view of which is shown in Fig. 1. All parts—balls, races, etc.—enter this room through a washing machine in which a solution of hot soluble oil is used to cleanse them thoroughly. Centrifuge types of filters attached to the two tanks of the machine remove the dirt from the solution almost as fast as it collects. The film of oil remaining on the parts ordinarily protects them from rust during the assembling operation. However, if the parts must remain in the department for a long period, as, for example, over a week-end, especially in the spring of the year, they are sprayed with oil by means of an air gun.

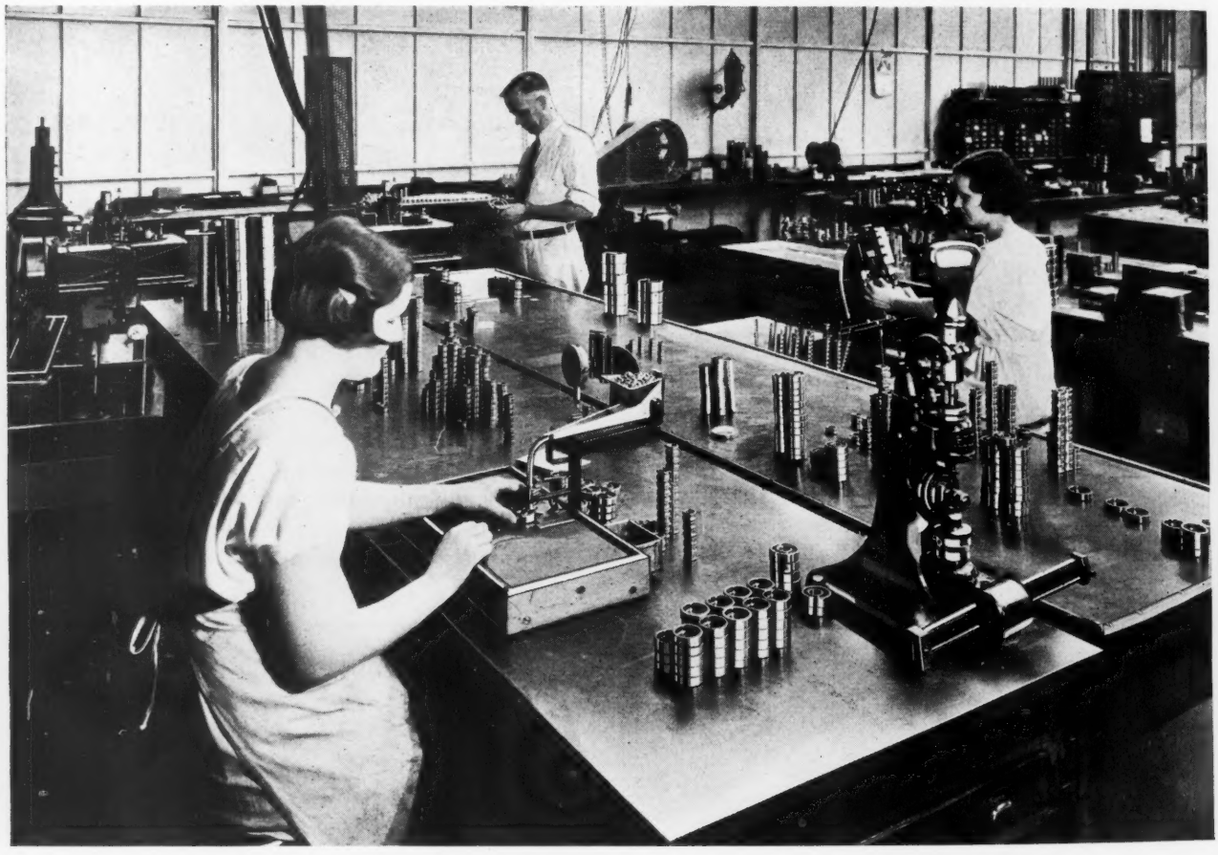


Fig. 1. Ball Bearings Being Assembled in a Room at the S K F Plant that is Supplied with Filtered Air

The assembling room is walled off from the remainder of the shop and is supplied day and night with air that is drawn from outside of the building and passed through filters to eliminate all particles of dust. The air in the department is completely changed every five minutes, although the room is approximately 90 feet long by 80 feet wide. Air is not drawn into the department from the shop,

because the pressure is always outward. The air-inlet ducts, eleven of them, are near the ceiling.

Cleanliness is promoted in the assembling room by requiring all employes, both men and women, to dress in white. This practice insures that all clothing is washed often. Table tops are covered with steel, and wooden boxes are not allowed in the department; in this way, wood splinters are eliminated in the assembled bearings.

The girl in the foreground of Fig. 1 is operating a fixture that inserts the required number of balls into each bearing. The girl on the far side of the table is operating an inspection fixture that checks the diameter of the groove in the inner races. At the near end of the table is another inspection device that determines the radial freedom of the assembled inner race with respect to the outer race. A total tolerance of from 0.0001 to 0.0003 inch is specified, according to the size of the bearing.

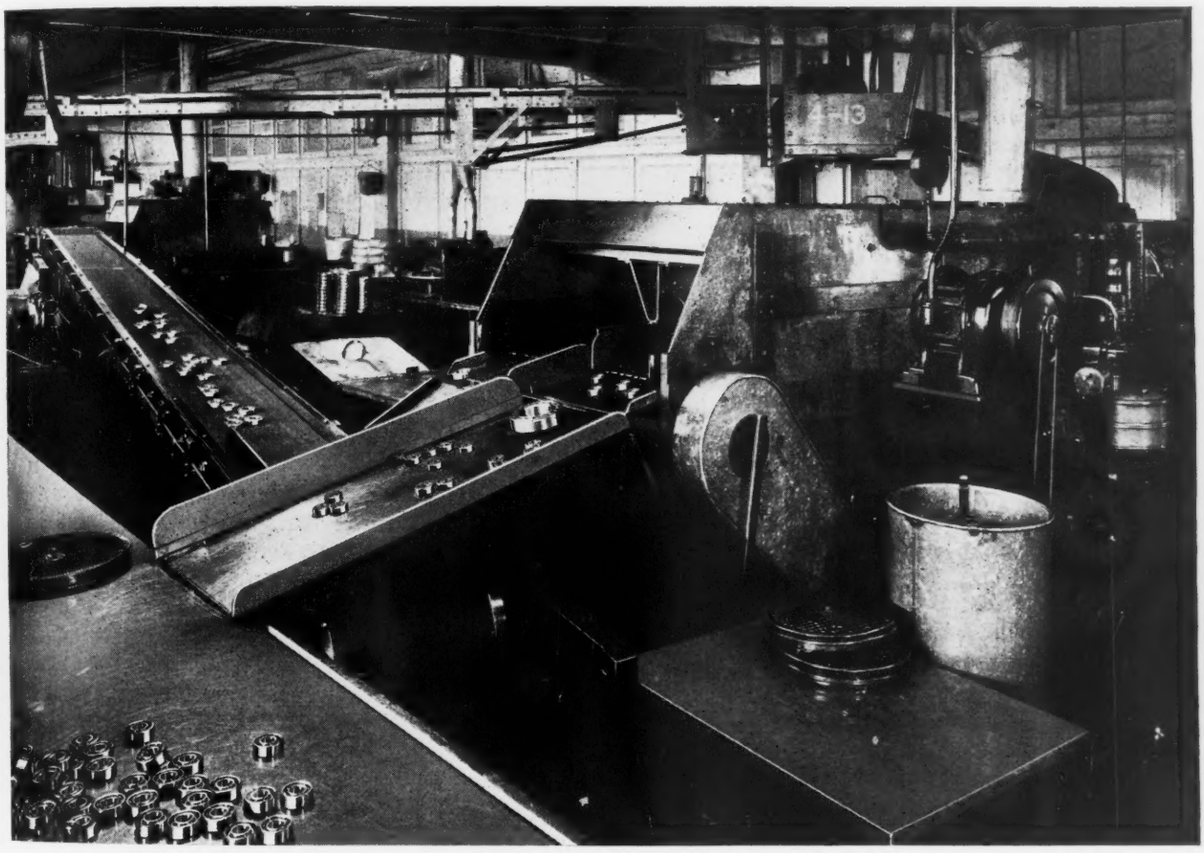


Fig. 2. In this Plant the Ball Bearings are Washed Three Times During the Assembly and Final Inspection

The Final Inspection Guarantees Accuracy and Quality

In spite of the fact that every effort is made to keep the bearings absolutely clean while being assembled, they leave the department on a conveyor which carries them through a washing machine that delivers them to the final inspection department. In this washing machine, kerosene is applied under pressure to all surfaces of the bearings, in order to insure that no particles of dirt are lodged anywhere. Fig. 2 shows bearings leaving this machine. All kerosene is blown from them by dehumidified compressed air at the end of this cleaning operation, and the bearings are then passed to the bench shown in the illustration on page 1 for the final inspection.

Some of the inspection equipment used may be of interest. The double lens microscope in the foreground permits a close examination to be made of the finished surface and facilitates the detection of minute surface defects. It has a magnification of 20 X.

The second fixture on the bench determines the eccentricity of the outer race in relation to the outside diameter, and of the inner race in relation to the bore. It also determines the "wabble" of the groove and sides of the inner race relative to the bore. All dimensions are double checked, this being the practice also through the manufacturing stages. Dimensional limits vary according to the bearing size and the class of service for which the bearings are intended. As an example, however, the tolerance on the bore of regular commercial bearings having a 5/8-inch bore would be plus 0.0000, minus 0.0004 inch. Incidentally, the balls used in a bear-

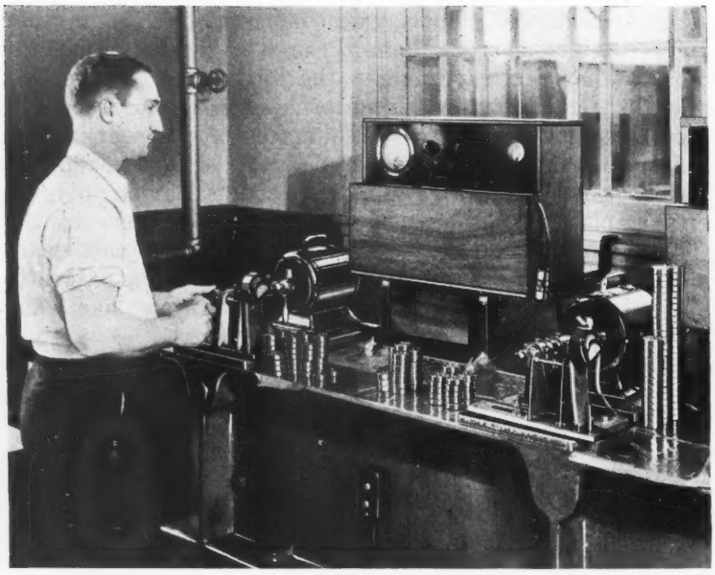


Fig. 3. Electrical Instruments Enable Definite Ratings to be Made of the Quiet-running Characteristics of Ball Bearings

ing of the size must be true as to diameter within plus or minus 0.000025 inch.

Although the final inspection department is supplied with filtered air, the bearings also are washed once more after the last inspector has finished with them. He places the bearings on the overhead conveyor belt seen in the illustration on page 1, which returns them to the washing machine illustrated in Fig. 2. They pass through this machine a second time on a conveyor that is entirely separate from the one on which they were carried through the first time.

A Special Grease Prepares the Bearings for Long Service

When the bearings have passed through this washing machine the second time, the kerosene is again blown off, and they are then placed on the conveyor that leads into the background of Fig. 2. From this they are removed and immersed in a hot slush of filtered grease that is maintained at a temperature of about 170 degrees F. The bearings are lowered into the slush in a basket, so that the grease can reach all surfaces. As soon as the bearings are raised into the air, the grease solidifies.

The grease used in this operation has been selected by the manufacturer because of its ability to lubricate the bearing and protect it from rust for an indefinite period in service. For best results, the bearings should be used without changing this grease.

After the grease has been applied, each bearing is wrapped individually in waxed paper and is then ready to be packed in cartons. Certain sizes, however, are first sent to the noise-testing room.

Where Quietness is Not a Guess

In the noise-testing room, the bearings are given a definite rating, according to their quiet-running characteristics. Use is made of Burgess Acoustimeters, one of which may be seen in Fig. 3. Each bearing is placed on an arbor, driven at high speed by a motor. The operator holds the outer race stationary, and as the inner race and the balls revolve, the vibration is detected by a pick-up unit and transformed into electrical impulses. These impulses are amplified so as to deflect the needle of an electrical meter. Readings of the amount of vibration are thus obtained in milli-amperes. Standards of quiet operation have been established for each size of bearing, and the bearings are graded in relation to these standards.

In order that this department may be entirely free from outside noises, it is separated from the shop by double walls and windows. The motors and fixtures used in the tests are mounted on heavy girders, supported on a foundation that is entirely separate from the factory foundation. Five-speed motors are employed, the maximum speed being 3000 revolutions per minute.

At the end of the manufacturing stages and before assembly, a certain percentage of the races of each lot of bearings is sent to the etching department, shown in Fig. 4, for checking the quality of

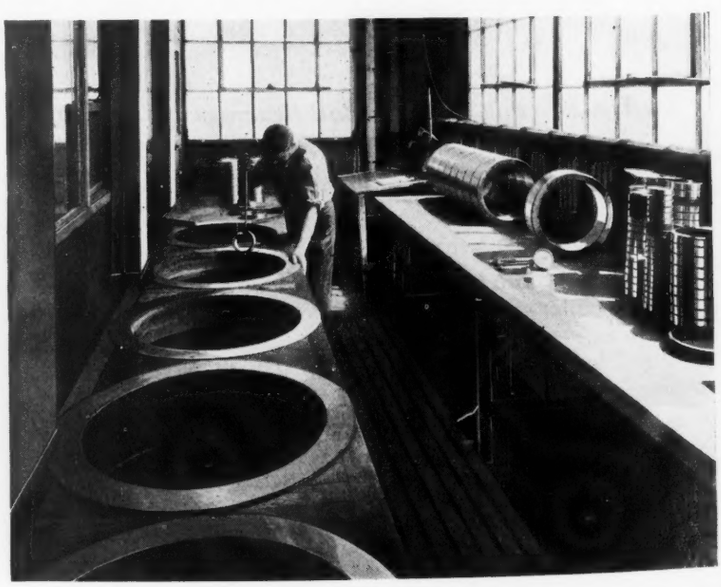


Fig. 4. Etching Department in which Bearing Races are Inspected for Quality of the Material, Heat-treatment, and Grinding

the material, the grinding, the heat-treatment, etc. Certain parts, such as those intended for use in airplanes, are sent to this department for a 100 per cent inspection. The etching process shows up hardening cracks, grinding checks, and other defects. Less than 0.0001 inch is etched from the surface in making these tests.

The etching process consists of immersing the parts successively into five different solutions. In the first tank, all grease and oil is cleaned from the parts by means of alcohol. The second tank contains a weak solution of nitric acid, which starts the etching. As the parts are darkened considerably in this bath, an alcohol and ammonia solution is used in the third tank to remove the carbon. Etching is completed in the fourth bath, which consists of a muriatic acid solution, the parts being immersed in this bath for a certain number of seconds. Finally, the parts are immersed in a second solution of alcohol and ammonia to counteract any muriatic acid that may remain.

The eye and microscope are then employed to observe any defects that may have been brought out by the etching. All satisfactory parts are polished and sent to the assembling department. Fumes from the etching tanks are carried from the room by an overhead exhaust system.

The extreme measures taken all through the manufacture of ball bearings to eliminate any chance of corrosion and to prevent harmful effects from dirt, chips, and other foreign particles should serve as an object lesson to the user. The manufacturer knows from experience what dirt and rust can do to his product, and has taken precautions to protect the bearings to the utmost. It behooves the user to approach as nearly as possible the conditions of cleanliness in applying the bearings that existed during their manufacture, and to see that a proper grease is supplied as required.

* * *

The Automobile Industry's Code

The code proposed by the National Automobile Chamber of Commerce for the automobile industry calls for a thirty-five hour week, with minimum wages ranging from 40 to 43 cents an hour for men employes and from 35 to 38 cents an hour for women employes. The code states that the employers in the automobile industry "propose to continue the open shop policy heretofore followed, under which unusually satisfactory and harmonious relations with employes have been maintained. The selection, retention, and advancement of employes will be on the basis of individual merit, without regard to their affiliation or non-affiliation with any labor or other organization." The automobile industry in Michigan employed, early in August, about 190,000 workers. It has been estimated that under the code agreement, 60,000 more workers will be employed.

* * *

At a recent meeting of the Birmingham (England) City Council, the gift by the Birmingham Chamber of Commerce to the City of the original Murdock locomotive was accepted. This engine was the first locomotive that ever was actually run anywhere in the world. It was constructed by Murdock in 1781 at Redruth, Cornwall.

The Age of Materials

The present era has been called the Age of the Machine, but it is just as much the Age of Materials. Through the use of new materials with properties unknown to the engineer and designer of only ten years ago, it is possible to achieve results that formerly were deemed beyond the reach of engineering. We incorporate today in our designs alloy steels and castings, aluminum and copper alloys, synthetic plastic materials, and even rubber, fiber, and cork, to accomplish ends undreamed of two decades ago. October MACHINERY will present a number of articles showing the broad application of present-day materials, and will point out to mechanical men the wide choice of materials that is now available to the designing engineer. October MACHINERY will be an outstanding number for those interested in the selection of materials and will suggest many new applications.

Objections to the Contract System in Toolmaking

Of the Many Abuses that have Crept into the Tool-making Industry During the Depression, the So-called "Contract System" is One of the Most Serious and Should be Combatted by All Fair-Minded Tool Manufacturers

By C. B. COLE
President Tool Equipment Sales Co.
Chicago, Ill.

IN normal times, the tool and die shops in the industrial centers of the country employ a large number of skilled mechanics. During the last three years, however, a great many of these shops have gone out of business. Some have become bankrupt, while others have closed their doors on account of lack of business or because competitors quoted prices that made competition impossible. Furthermore, many manufacturing plants that formerly maintained large tool-rooms have been compelled to reduce the number of their employes. Therefore, there is a tremendous surplus of tool- and die-makers, and it is almost as impossible for these men to obtain work at a living wage as it is for the tool and die shop to obtain business that will permit a legitimate margin to meet expenses.

How the Contract System Works at the Present Time

In requesting quotations on a quantity of tools and dies, it is the general practice for a manufacturing plant to call in representatives of a number of tool and die shops and give them prints of the tools to be quoted on. In some cases, instead of tool drawings, prints of the pieces to be made are given to them. The latter procedure is cheaper for the manufacturing plant, as it eliminates the cost of designing the tools. After obtaining the blueprints, the tool and die shops begin to figure on how low the quotation must be made in order to get the business.

In normal times, the tool shops would take into consideration the prevailing cost of labor. Under the contract system which now prevails in some of the large tool centers throughout the country, this factor is given very little consideration. The tool shops that employ toolmakers on a contract basis figure material costs first; the cost of labor is secondary.

This method is possible because of the contract system, which works in this way: An order is obtained for a die. The price quoted is $100. The cost of materials, including standard die-set parts, is $30. The owner or foreman then calls one of the diemakers to his desk and tells him that he has a job for him, and that he will receive $30 for making the die. The diemaker knows from past experience that ordinarily it would take about three weeks to make the die properly. He objects to the low price offered him, but is told that if he does not want to take the job at the price offered, there are plenty that will. The diemaker, knowing that his chances to get another job are very slim, decides, against his better judgment, to take the job at the price offered. By working at top speed and without any mishaps, he might be able to complete the die in two weeks. On this basis, his wages are at the rate of $15 a week. Should he encounter trouble, the average would be less.

The case cited is not fictitious, but an everyday occurrence in several large industrial centers in the country. In fact, the author knows of an instance where a toolmaker was paid $5 for a week's work. In some sections, it takes a very good man to average from 25 to 30 cents an hour in a contract shop.

The Effect of the Contract System on the Supply of Skilled Toolmakers

It is evident that such wages will not induce skilled craftsmen to remain in a trade where they cannot earn a fair living, and at the first opportunity they will leave it; nor do such low wages encourage young men to learn a trade that will not provide a reasonable standard of living. In 1929, there was a noticeable shortage of tool- and die-makers. Were business normal, this shortage would be still greater at the present time. The scarcity of tool- and die-makers will be felt severely when manufacturing plants resume operations on somewhere near capacity basis.

The results of the contract basis for paying tool- and die-makers are far-reaching in their effects on the social and industrial life of the country. This system causes skilled craftsmen to seek other employment. Many will never return to their old trade. Men that were honest and industrious have become shiftless and lazy; others have had their pride of craftsmanship utterly destroyed. The writer knows a number of tool- and die-makers who have not worked at their trade for almost two years. They have been supported by charity, and most of them say that they will never work at their trade again. In fact, some of them have so lost their grip on life that it is doubtful if they will ever work at anything again. Men of this type become fertile ground for the agitator.

The effect on skilled labor is only a part of the evil consequences of the contract system. Let us note the effect on the tool and die shops themselves. The system has ruined their machine tools and other equipment, because men working against time and for a definite price for the job will not take time to care for their machines. They will crowd and force the machines and small tools to the limit, in order to get the job finished in the shortest time. And, what is more, the tool shops have gained nothing in the way of increased business, for when all the shops have adopted the same ideas in regard to paying labor, none has an advantage over the remainder, and the result is simply an entire industry ruined by its own shortsightedness.

Most Tool and Die Shops Overlook the Overhead

The average owner of a tool and die shop does not seem to realize that overhead is a very definite thing. Some have also lost sight of the need for replacements that will have to be made if their shops are to remain in business. Perishable tools wear out rapidly enough when used in a normal manner; when they are abused, their life is very short. Therefore, some shops that think they have an apparent profit are actually taking a direct loss. Many a tool and die shop has actually paid its customers real money for the privilege of doing work for them.

Another idea that has resulted in considerable loss to the tool and die shops is that of taking work at a price that would "just be sufficient to pay overhead." Most of the work accepted on this basis results in a direct loss. By not making a legitimate profit on the work done, the working capital of these shops is often seriously depleted. A great many of them have none at all and are in such a financial situation that they exist only by grace of their creditors.

Some of the banks are responsible for allowing these shops to continue in business to the detriment of those who are trying to do business on a legitimate basis. The banks are apparently lenient, because, if they threw the badly managed shops into bankruptcy, the bank would receive only 5 or 10 cents on the dollar, and so these shops are permitted to continue to do incalculable damage to the better managed shops.

The Manufacturing Plant that Buys Cheap Tools Often Pays Dearly for Them

The manufacturing plants that purchase their tools from shops operating on the contract basis often have a sad awakening. Instead of obtaining just what they pay for, they often find that the tools purchased at a low initial cost will ultimately cost them much more than if they had purchased good tools in the first place. Men that are seriously underpaid are likely to slight their work, and everyone familiar with tools and dies knows that there are many ways in which this can be done. The hidden quality in tools is not always visible to the eye, but it will show up in production costs and in maintenance costs.

A few of the progressive purchasers of tools and dies realize this and have issued instructions to their purchasing departments and mechanical executives not to buy tools from shops operating on the contract basis, as they have discovered that poorly made tools cost entirely too much in the end. Production is delayed and stopped, and maintenance costs mount high.

The tool shop that obtains work too cheaply is going to figure out possible ways by which to "get out from under" without a loss; therefore, they buy the poorest quality of materials and encourage their employes to turn out the job so that it will just "get by."

Good tools are a necessity in every manufacturing plant. Steady, reliable, and adequate sources of supply must be available at all times. Therefore, it is in the interest of the manufacturing industries who have large requirements for tools, dies, jigs, fixtures, gages, etc., to aid in correcting the evils caused by the contract system now in operation in a great proportion of the tool and die shops in the large industrial centers. It would seem that a condition such as outlined would tend to correct itself as better business returns; but unless steps are taken to aid this recovery, it may take entirely too long a time, and more serious damage will be done. Hence, this article is a plea for earnest consideration of the facts recorded.

* * *

Largest Anti-Friction Bearing Ever Made

What is believed to be the largest anti-friction bearing ever made is exhibited by the Timken Roller Bearing Co., Canton, Ohio, at the World's Fair in Chicago. This bearing weighs 7000 pounds and has a load-carrying capacity of 8,000,000 pounds. It was designed for use on the roll-necks of steel mills. The increasing interest in bearings for railroad cars and locomotives is also evidenced by the display of a Timken railroad bearing.

Notes and Comment on Engineering Topics

Almost 3500 tons of 3 per cent nickel-steel plate will be used to hold the cable eye bars on the new San Francisco-Oakland Bridge. This bridge, the largest in the world, will be 7 1/2 miles long, of which 5 miles will be over open water.

The magnitude of the elevator equipment in a large office building is exemplified by the fact that seventy-four elevators are to be used in the RCA Building just completed in the Rockefeller Center in New York City. Fifty of these elevators are of a special high-speed type operating at speeds of from 800 to 1200 feet a minute. The elevator installation is designed to handle an estimated daily "resident and transient" population in this building of more than 50,000 people.

What is considered a revolutionary method of steel-making will be employed by the Rotary Electric Steel Co. in its new plant near Detroit, Mich. The steel is made in an electric furnace and then cast by a centrifugal process. Instead of casting an ingot in a stationary mold, the molten metal is poured into a large circular mold which is rotated at high speed. When sufficiently cool, the casting, in the form of a huge ring, is cut into billets and rolled in the ordinary manner. The electrical equipment, which is furnished by the Westinghouse Electric & Mfg. Co., includes a 10,000-K.V.A. electric-furnace transformer and fifty-six electric motors.

A unique valve for handling corrosive and abrasive fluids under fairly high pressure has been developed by the B. F. Goodrich Rubber Co., Akron, Ohio. This valve, known as the "Vulcalock" valve, is lined with an acid-resisting rubber compound, either hard or soft, depending on the conditions of the service to which the valve will be subjected. The rubber lining of the valve is bonded to the metal parts with practically integral adhesion. In the entire valve, the corrosive and abrasive materials come in contact only with rubber compounded to resist any deteriorating action of these materials. The valve can be taken apart and easily reassembled without the use of special tools. It will doubtless find a wide application, especially in the chemical industries.

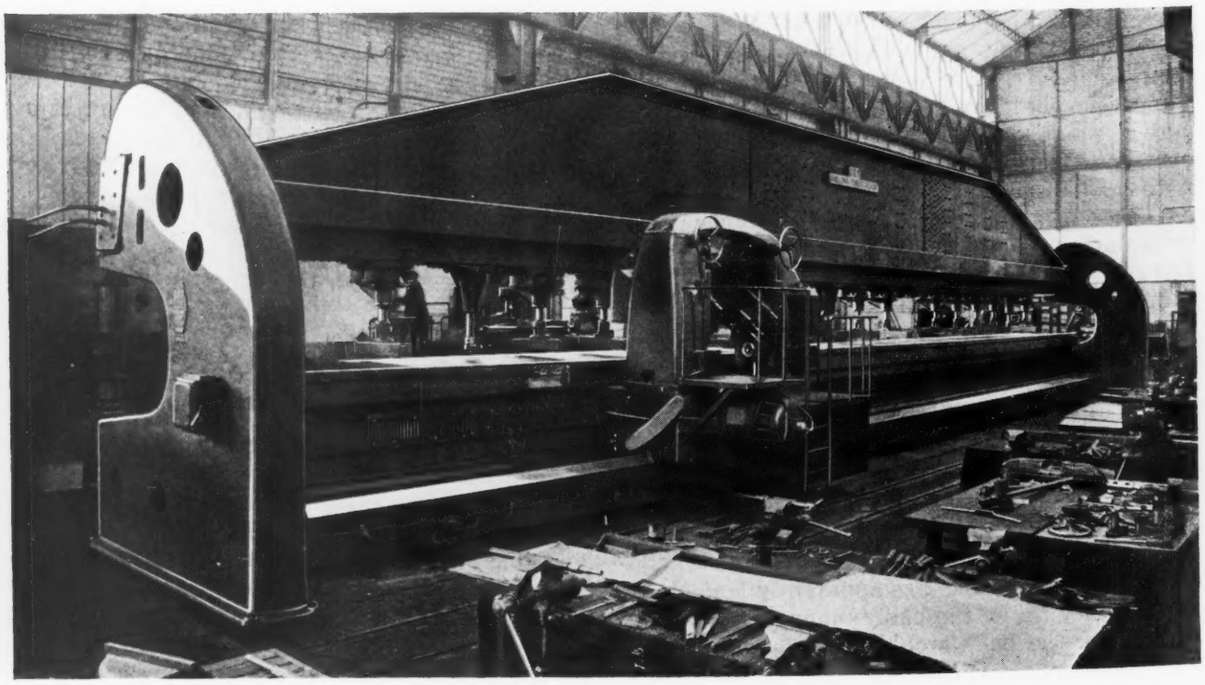


Plate-trimmer Built by Ateliers G. S. P., Albert, France, having a Total Travel of the Tools of 60 Feet and Weighing 96 Tons

How a Magazine and Hopper Feed Stepped up Production Eight Times

By J. E. FENNO

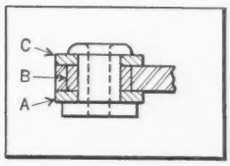


Fig. 1. Bushing and Lever Insulated by Fiber Washers

IN many plants manufacturing electrical devices, the pivot-bushings for electric switch mechanisms are frequently insulated by means of fiber washers. A typical example is the brass switch bushing shown in Fig. 1, which is mounted on a steel lever, as indicated by the double section lines. In order to prevent the current from passing from the bushing to the lever, both members are separated by the fiber washers *A*, *B*, and *C*. Two operations are required to complete this assembly: In the first, washers *A* and *B* are forced on the bushing; in the second, the lever is assembled in place, the washer *C* added, and the end of the bushing spun over, thus joining all parts tightly.

At one time, the first operation was performed by hand tools, but owing to the difficulty of handling such small parts, the production was exceedingly low. As a result, the assembling fixture illustrated in Figs. 2 and 3 and the bushing hopper shown in Figs. 4 and 5 were designed. In the fixture, washers *A* and *B* are automatically fed from separate magazines to a position directly over the bushing, which is also fed automatically into position from the hopper. With this arrangement, one operator assembles nine bushings in the time previously taken to assemble one. To obtain this production, two identical fixtures were built. They are mounted in two adjoining power presses which operate continuously. One hopper is used for both presses.

Design of the Fixture and Its Operation

Referring to Fig. 2, the fixture consists of the base *A*, pusher slides *B* and *C*, magazines *D* and *E*,

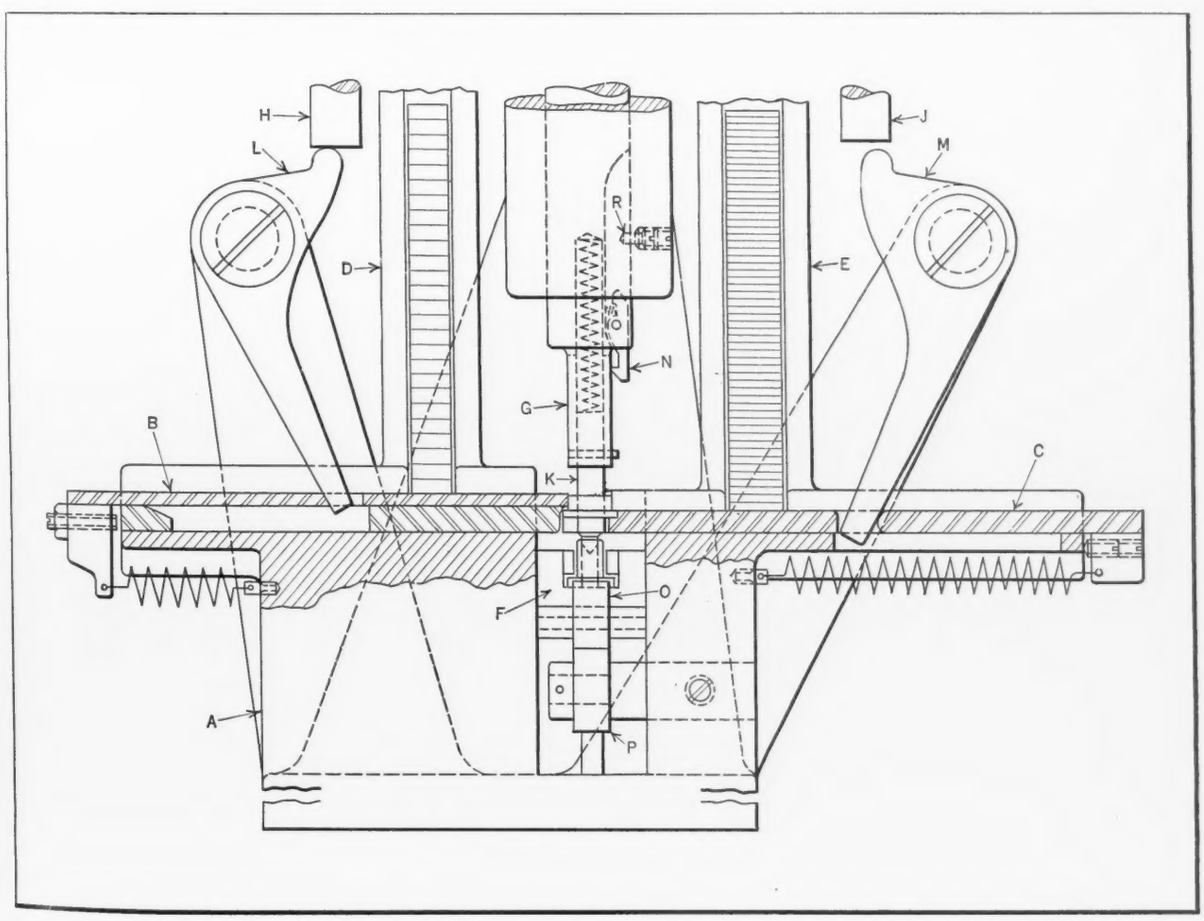


Fig. 2. Fixture Equipped with Two Magazines and a Hopper for Automatically Assembling Washers A and B on the Bushing Shown in Fig. 1

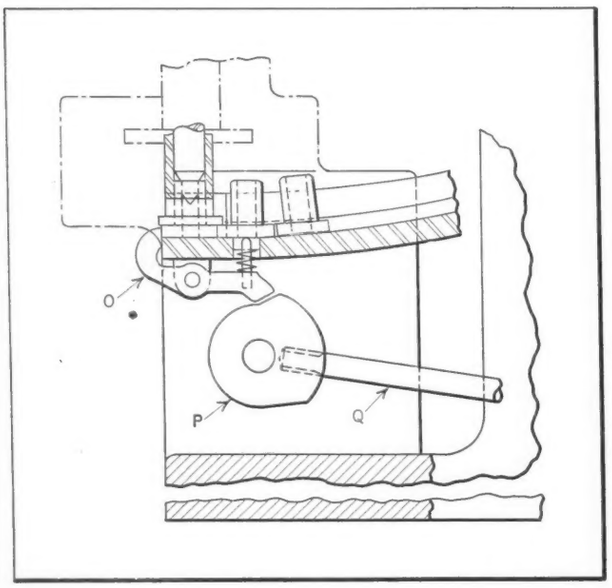


Fig. 3. Section through Fixture and Bushing Chute (Fig. 2), Showing how Flow of Bushings is Regulated

bushing chute *F*, and assembling plunger *G*. The base *A* is fastened at the front of the press table to clear the ram. Plunger *G* and stops *H* and *J* are given a vertical reciprocating movement by means of an extension arm (not shown), secured to the press ram. The plunger and stops are fastened to the end of this arm.

In the position indicated, the press ram has moved downward a portion of the way. The spring-actuated centering pin *K* has passed through the washers and its pointed end is resting in the end of the bushing hole. As the plunger continues to descend, stops *H* and *J*, which are backed up by coil springs, engage the levers *L* and *M*, forcing the slides *B* and *C* outward to allow the end of the plunger to press the washers on the bushing. Pin *K*, in the meantime, recedes into the plunger and is held there by latch *N*.

When the plunger has reached the bottom of its stroke, the slides will have moved outward far enough to allow two more washers from the magazines to be deposited on them; as the plunger ascends, these washers will be carried inward until they are directly over the center of the chute. The reason for the latch *N* will now be evident. Without it, pin *K* would be in the position shown or directly in the path of the washers being fed over the bushing.

As the plunger continues its ascent, gate lever *O* (see Fig. 3) is given a slight counter-clockwise movement by means of the cam *P*, which is oscillated by a link connecting the rod *Q* to the press ram. This movement causes the upper end of the gate lever to drop far enough to allow the assembled parts to be ejected by a blast of compressed air.

The next bushing, however, is held in the chute by a pin in the other end of the gate lever. Plunger *G* (Fig. 2) now approaches the top of its stroke, and latch *N* is released as it engages stop *R*, allowing centering pin *K* to project from the plunger.

On the downward stroke of plunger *G*, the cam *P* returns the gate lever to its former position, allowing the bushing which was held back by the pin in the gate lever to move to the position occupied by the ejected parts. Then the plunger continues to descend until it is in the position shown in Fig. 2, where the centering pin *K* has passed through both washers and rests in the end of the hole in the bushing. This completes one cycle of the operation.

Important Points on the Fixture Design

An important point to remember in designing this fixture is that the stops *H* and *J* must be located so that the movement of slide *C* is slightly in advance of slide *B*. With this arrangement, the bottom washer will reach its central position first; otherwise, a collision between the two washers would result. Incidentally, should jamming of the washers occur, no damage would be done to the fixture, as the pusher slides are carried inward by

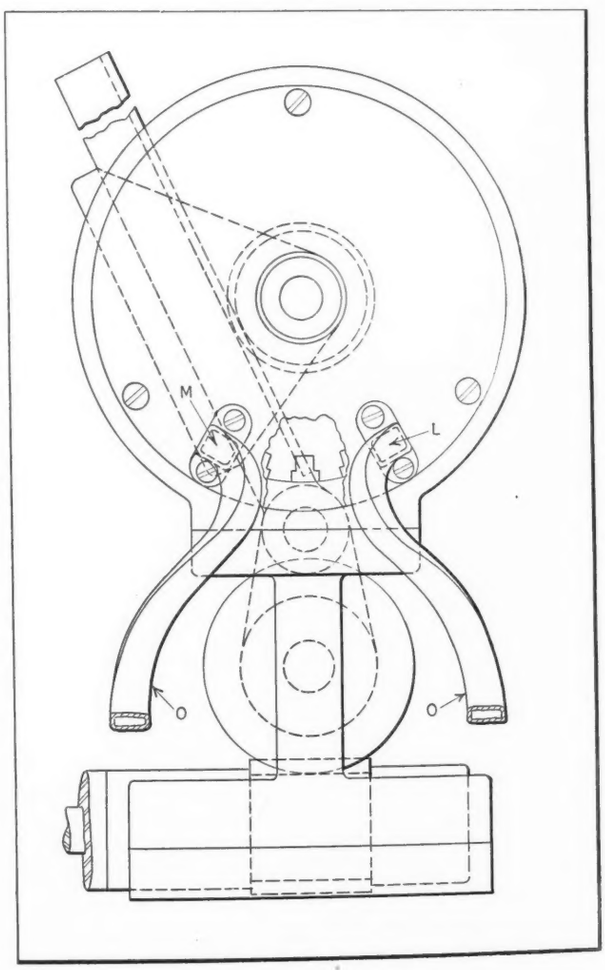


Fig. 4. End View of Hopper Shown in Fig. 5, Showing the Oscillating Mechanism and the Two Tubes for Conveying the Bushings to the Presses

spring tension only. It should be mentioned, also, that the outward movement of levers *L* and *M* is limited by stops (not shown) which arrest the movement of stops *H* and *J* when the slides are in position to receive the washers from the magazines. The springs back of stops *H* and *J*, however, must have a greater resistance than the coil springs on the slides.

Double Chute Hopper for Supplying Two Presses

The bushing hopper illustrated in Figs. 4 and 5 is also of interesting design. Its principal members are the base *A*, Fig. 5, mounted above the fixtures on a pedestal bolted to the floor; the oscillating shell *B*, mounted on the shaft *C*; the stationary disk *D* fastened to the ring *E*; and the crank and rack mechanism through which the oscillating movement of shell *B* is transmitted from the pulley *F*. This pulley is driven from an overhead countershaft; to obtain the required speed reduction and power, a worm and worm-gear drive was incorporated in the design. Further than this, the operation of the driving mechanism is so obvious, it will not be described.

A number of bushings are dumped into the hopper at *G*. As the shell *B* oscillates, the bushings are agitated and those in the correct position will pass through the openings *H*, which are closely spaced around the end of the shell. The bushings passing through these openings enter the annular chamber *J*, as indicated at *K*. When there are a sufficient number of bushings in this chamber, some of them will pass through the holes *L* and *M* (Fig. 4) in disk *D* and into the tubes *O* which lead to the two power presses equipped with the fixtures described. The flow of bushings in these tubes will continue while the shell *B* oscillates and the hopper is kept supplied with bushings.

It is interesting to note the action of the bushings in the annular chamber *J*. In developing the hopper, a continuous rotary movement of the shell *B* was first tried. It was found, however, that only one of the tubes was kept filled with bushings. When the oscillating movement was tried, an even distribution resulted.

This can be explained as follows: With the continuous drive, the rubbing contact of the bushings in the openings *H* with the bushings in the annular chamber *J* caused the latter bushings to be forced along one side of this chamber. Consequently, the tube on that side received most of the bushings. Another tube opening was then cut in disk *D* just below this tube. It was found, however, that placing the two outlets so close together impeded the flow of bushings in both tubes.

With the present arrangement, the oscillating movement of the shell causes the bushings to be forced alternately from one side of the chamber to the other, supplying both tubes with an equal number of bushings. An important point in the design of this hopper is the angular part of the base at *P*, which is bolted to the pedestal. This angularity permits the hopper to assume a tipped position, which aids the bushings in entering both the openings *H* and the tubes.

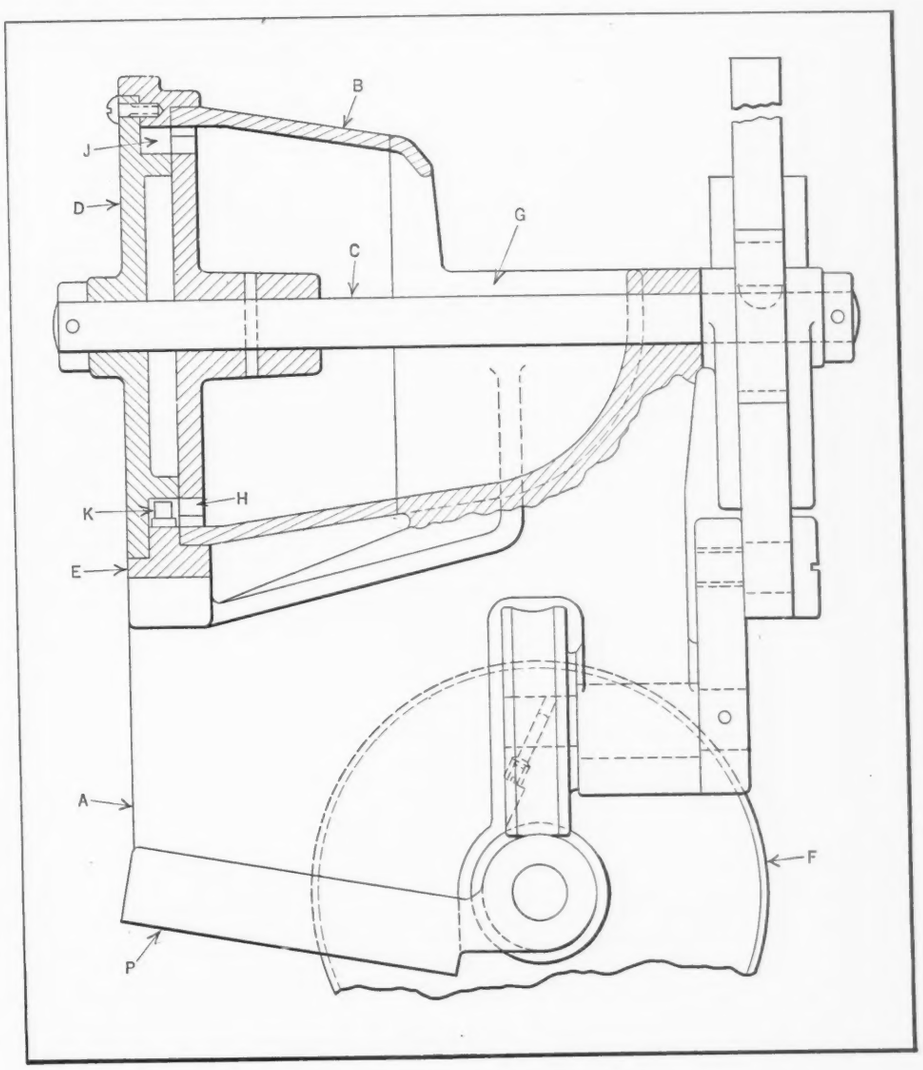
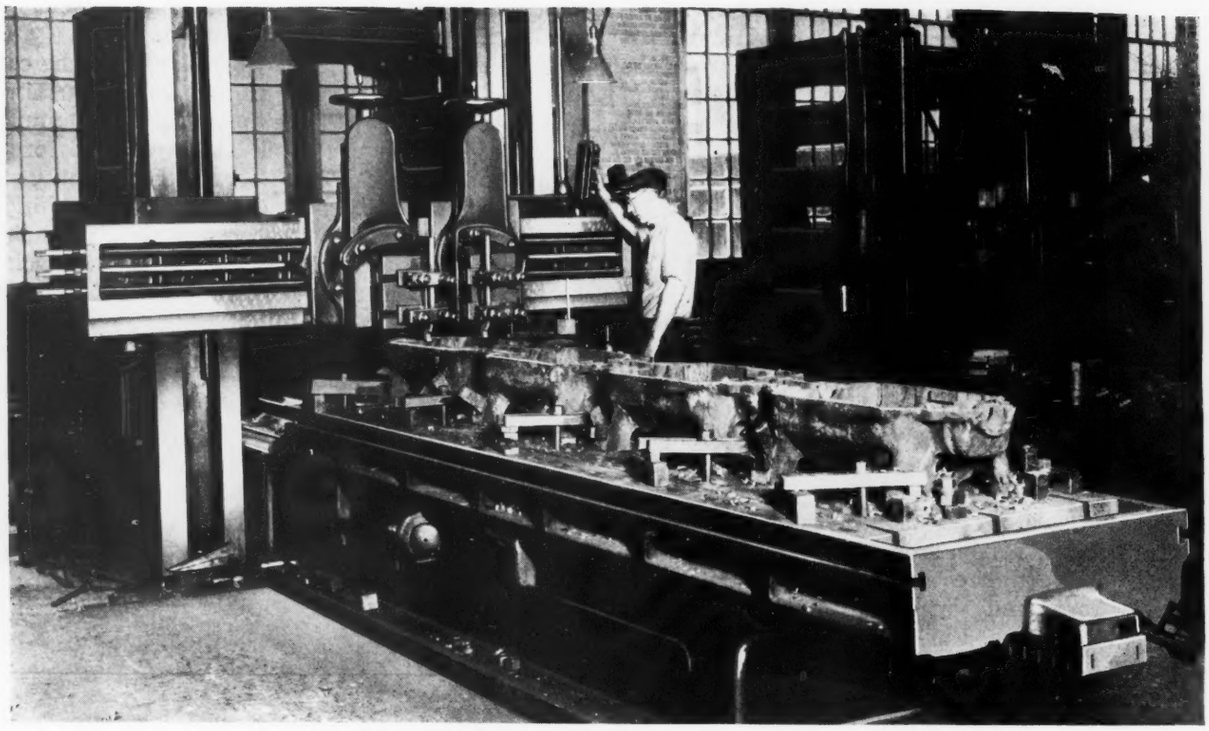


Fig. 5. Conical Hopper of the Oscillating Type for Maintaining a Steady Flow of the Bushings to Two Presses Equipped with Fixtures Like That Shown in Fig. 2



Modern Metal-Cutting Materials and How to Select Them

The Results of Extensive Tests at the East Pittsburgh Plant of the Westinghouse Electric & Mfg. Co. Serve as a Guide in Selecting Cutting Materials

By J. M. HIGHDUCHECK, Supervisor Cutting Tools and Applications
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THE development of improved metal-cutting materials has progressed very rapidly within the last few years. During this time the improved high-speed steels, Stellite, and tungsten carbide have probably received more publicity than any other one class of production equipment. Notwithstanding this fact, many manufacturers are still using the older cutting tool materials for work that could be done better and at lower cost by one of the improved materials.

The different materials now available vary greatly in their characteristics and cutting capacities. It is important that the right grade or kind of cutter material be selected for the class of work to be done and that the proper feeds and speeds be employed. In some cases, the new materials have not produced the results expected, simply because they were used on work for which they were not intended or because they were not properly applied. No single cutting material is adapted for all kinds of tools or purposes. On the other hand, the great variety of materials now available makes it possible to find an efficient cutting material for any specific purpose. To obtain data that would simplify the problems met with in selecting and applying cutter materials, the writer has conducted extensive tests during the last four years, the results of which are given in this article. The accompanying tables have been especially prepared for use in selecting cutting tool materials and for planning production and machining practice.

Cutting Materials Selected for Westinghouse Standard Practice

The kinds of cutting tool materials adopted as standard as the result of these tests include: (1) Tungsten high-speed steel; (2) low-cobalt high-speed steel; (3) high-cobalt high-speed steel; (4) Stellite No. 3; (5) Stellite J-metal; (6) tungsten carbide; and (7) tantalum carbide.

This list includes the different kinds of cutting tool materials to be considered in this article. The compositions of these materials are given in Table 1. A comparison of the cutting speeds recommended for the different materials is shown by the constants in Table 2, and the speeds and feeds established as Westinghouse practice for each material, when used for roughing and finishing cuts, are given in Tables 3 and 4.

Table 1. Composition of Typical High-Speed Steels

Elements	Tungsten High-Speed Steel, Per Cent	Low-Cobalt High-Speed Steel, Per Cent	High-Cobalt High-Speed Steel, Per Cent
Carbon	0.60 to 0.75	0.65 to 0.75	0.70 to 0.80
Manganese	0.15 to 0.40	0.25 to 0.35	0.40
Phosphorus	0.03	0.03	0.04
Sulphur	0.03	0.03	0.025
Silicon	0.15 to 0.40	0.20 to 0.40	0.50
Chromium	3.00 to 4.50	4.00 to 4.25	4.00 to 5.00
Vanadium	0.75 to 1.50	0.90 to 1.10	1.50 to 2.25
Tungsten	17.00 to 19.00	17.00 to 18.00	17.50 to 19.50
Cobalt	.....	4.50 to 5.00	7.50 to 10.00
Molybdenum	.....	0 40 to 0.50	1.00

Characteristics of Tungsten High-Speed Steel

The tungsten high-speed steels belong to the high-tungsten low-vanadium group. The property of "red hardness," or the ability of the tool to retain a cutting edge when heated to high temperatures, is the prime characteristic. This steel is used for forged cutting tools, taps, threading dies, end-mills, milling cutters, punches and dies for metal stamping work, drills, reamers, and lathe centers. It is the easiest to harden of all the different brands of high-speed steel on the market, and cutter tools made from it give satisfactory service when used under normal machining conditions, regardless of the material being machined.

Tools of this material are forged from solid steel, regardless of the size. They are generally used for light work and are operated at slower speeds than tools made from any of the other six materials listed. Twenty-four tungsten high-speed steel lathe and boring machine tools, including the conventional forms used for turning, boring, and threading operations, have been adopted as standard for this cutting material in the Westinghouse plant.

Low-Cobalt High-Speed Steel Adapted for Finishing Tools

As a general rule, finishing tools should be tough and hard. Low-cobalt high-speed steel answers this requirement very satisfactorily. Sixteen tools tipped with this material have been listed as Westinghouse standard. The chemical composition of the cutter tips made from this material is given in Table 1. The advantages of this steel over the high-tungsten high-speed steel are due to the high temperatures it can stand and to its ability to maintain a good cutting edge under long finishing cuts. This material has been found better adapted for screw machine work than the high-tungsten or even the high-cobalt high-speed steel.

High-Cobalt High-Speed Steel Meets Requirements for Heavy-Duty Roughing Cuts

High-cobalt high-speed steel is perhaps the most economical cutting material for heavy-duty roughing work. Its adaptability for this work is now generally recognized. The grade of high-cobalt high-speed steel having the composition given in Table 1 possesses a higher degree of breakdown strength when the temperature is raised by the cutting action than it has at normal room temperature. Thirty tools tipped with this material and shaped for heavy machining operations have been adopted as Westinghouse standard.

As a rule, it is not recommended that high-cobalt steel be forged. This can sometimes be done advantageously, however, in the case of small tools. It has been proved repeatedly that cobalt steel requires much closer observation of the heat when it is being forged than high-tungsten high-speed steel. If the forger can identify the critical heat accurately, he should be given the job of forging roughing tools from this material, as they can be made in sizes for which tipping would be impractical.

Tipping High-Speed Cutting Tools

Tipped tools are economical only in the large sizes, that is, when the cross-section of the shanks is 1 1/4 by 1 1/4, 1 1/2 by 1 1/2, 3/4 by 1 1/2, or 1 by 2 inches, etc. The writer does not recommend tipping shanks having cross-sections 1 by 1, 3/4 by 3/4, 5/8 by 1 1/4, or 1/2 by 1 inch, etc. The cutting tool should be so designed that the tip can be cut from bar stock. Care should be taken to avoid excessive grinding, and at the same time, sufficient allowance should be made for grinding the deep skin produced in hardening. Three typical forged shanks and their tips, as prepared for welding, are shown in Fig. 1, together with a tool on which a high-speed steel tip has been welded.

Selection of Shank Material for Tipped Tools

Fig. 2 shows a typical tool of tipped construction. As this is a roughing tool, it is tipped with high-cobalt high-speed steel. The shank material contains 0.50 to 0.63 per cent carbon, 0.60 to 0.90 per

Table 2. Constants Developed in Westinghouse Plant for Calculating Cutting Speeds*

Kind of Cutting Material	Kind of Material to be Cut	
	Cast Iron, Semi-Steel, Malleable Iron, and Bronze	Cast Steel and Axle Steel S A E 1035
1. Tungsten High-speed Steel	1.00	1.00
2. Low-cobalt High-speed Steel	1.20	1.15
3. High-cobalt High-speed Steel	1.30	1.25
4. Stellite No. 3	1.45	†
5. Stellite J-Metal	1.45	1.60‡
6. Tungsten Carbide	2.85	†
7. Tantalum Carbide	†	2.05§

*Constants express ratio of speeds used in rough- and finish-cutting various metals with tools of different materials (see footnotes ‡ and §).

Example—The cutting speed for cast iron, using a tungsten high-speed steel cutter is set at 80 surface feet per minute: What speed would be used with a high-cobalt high-speed steel cutter? *Answer*—80 × 1.30 = 104 surface feet per minute.

† Application for which cutter is not recommended.

‡ For finish-turning and boring, the constant may be 1.80.

§ For finish-turning and boring, the constant may be 2.30.

Table 3. Speeds and Feeds for Rough-Turning and Boring with Modern Cutting Tools*
(Westinghouse Practice)

Cutting Tool Material	Cast Iron, General Grade		Semi-Steel or Hard Grade of Cast Iron		Malleable Iron		Bronze		Cast Steel		Axle Steel S A E 1035	
	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed
1. High-tungsten High-speed Steel	80	0.031	60	0.015	95	0.031	140	0.031	65	0.031	75	0.031
2. Low-cobalt High-speed Steel	96	0.031	72	0.021	114	0.031	168	0.031	74	0.031	86	0.031
3. High-cobalt High-speed Steel	105	0.031	78	0.025	123	0.031	182	0.031	82	0.031	93	0.031
4. Stellite No. 3	116	0.031	87	0.031	138	0.031	203	0.031	†	†	†	†
5. Stellite J-Metal	116	0.031	87	0.031	138	0.031	203	0.031	104	0.031	120	0.031
6. Tungsten Carbide	228	0.031	171	0.031	270	0.031	400	0.031	†	†	†	†
7. Tantalum Carbide	†	†	†	†	†	†	†	†	133	0.031	153	0.031

*Speed in surface feet per minute and feed in inch per revolution, taking cut ¼ inch deep.
†Application for which cutter is not recommended.

cent manganese, 0.04 per cent phosphorus, and 0.15 per cent silicon. This grade of steel is very satisfactory for tipping with all the brands of cutting material mentioned. For high-speed and cobalt materials, including Stellite, the seat for the tip is drop-forged. After cooling, the scale is removed from the seat by sand-blasting. The tips are cut from bar stock according to dimensions on detail sheets, such as shown in Fig. 2.

Having on one side high-cobalt high-speed steel, and on the other cemented tungsten carbide, Stellite steel holds an important place as a cutting material. The ability to maintain its cutting edge at a red heat makes it a very valuable cutting material. It can be used at high speeds and is particularly useful in machining work requiring a long, continuous cut that cannot be interrupted to permit sharpening the tool.

Savings Realized from Using Tipped Tools

Cutting tools are necessarily expensive, especially those forged from solid high-speed steel. In the heading illustration is shown a set-up in which two 1- by 2- by 18-inch high-cobalt high-speed steel tipped tools are used in roughing down cast-steel motor frames. Each tool weighs about 10 pounds. Had these tools been made solid, the steel would have cost approximately $6.50. The labor for forging and grinding would have added $3 more, making the total cost of each solid tool $9.50.

To reduce the cost, tips of high-cobalt high-speed steel were welded on a cheaper grade of shank steel, which cost about 15 cents a pound. Having 10 pounds of shank material at $1.50 and 1/4 pound of cobalt steel for the tip at 35 cents, the labor in drop-forging the seat, welding the tip on, and hardening, plus the grinding cost, amounting to $3.80, brought the total cost of the tipped tool up to $5.65, a saving of $3.85 on each tool. The life of the tipped tool was 40 per cent longer and the speed was increased 25 per cent over that obtainable with the conventional high-tungsten high-speed steel previously used. These savings can, of course, be obtained only when the cobalt steel is suitable for the work to be done.

Table 4. Speeds and Feeds for Finish-Turning and Boring with Modern Cutting Tools*
(Westinghouse Practice)

Cutting Tool Material	Depth of Cut 1/8 Inch								Depth of Cut 1/16 Inch			
	Cast Iron, General Grade		Semi-Steel or Hard Grade of Cast Iron		Malleable Iron		Bronze		Cast Steel		Axle Steel S A E 1035	
	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed
1. High-tungsten High-speed Steel	100	0.015	72	0.015	126	0.015	182	0.015	95	0.015	100	0.015
2. Low-cobalt High-speed Steel	120	0.015	76	0.015	151	0.015	218	0.015	108	0.015	115	0.015
3. High-cobalt High-speed Steel	130	0.015	94	0.015	163	0.015	236	0.015	118	0.015	125	0.015
4. Stellite No. 3	145	0.015	104	0.015	182	0.015	263	0.015	†	†	†	†
5. Stellite J-Metal	145	0.015	104	0.015	182	0.015	263	0.015	171	0.015	180	0.015
6. Tungsten Carbide	310	0.015	223	0.015	390	0.015	564	0.015	†	†	†	†
7. Tantalum Carbide	†	†	†	†	†	†	†	†	218	0.015	230	0.015

*Speed in surface feet per minute and feed in inch per revolution.
†Application for which cutter is not recommended.

Classification of Cutting Materials According to Economical Cutting Speeds

After many applications and close observation of the behavior of the different brands of cutting materials, the writer established the constants given in Table 2, which represent the comparative cutting speeds recommended for the seven different cutting materials when used for cutting two classes of materials—ferrous and non-ferrous. Comparisons are based on assigning 1.00 as the constant for tungsten high-speed steel, which has the lowest recommended speed of the materials listed. The cutting material having the next higher speed is the low-cobalt high-speed steel. The recommended cutting speed for this material is 1.20 times that recommended for tungsten high-speed steel. Hence, the constant is 1.20.

The use of these constants is indicated by the following example: In machining a medium grade of cast iron, using the conventional grade of high-speed steel (No. 1 in Table 2), the most economical cutting speed was found to be 80 feet per minute, with a feed of 0.031 inch. If we change to a cutting tool made of high-cobalt steel, what speeds should be used? *Answer:* $80 \times 1.30 = 104$ feet per minute. If, however, tungsten carbide were used, the speed would be $80 \times 2.85 = 228$ surface feet per minute, 1.30 and 2.85 being the constants given in Table 2 for these materials.

The speeds given in Table 3 are the results established after observation of various production applications made in accordance with the constants given in Table 2. These speeds are recommended for general work and have been found practical. The feeds are usually governed by the structure of the work. In a great many cases, the structure is such that the feeds given represent the maximum feed possible to avoid springing or chattering of the work. The speeds in Table 3 are for continuous cutting without a lubricant. If a lubricant is used, the given speed should be increased 25 per cent. If the work to be machined involves intermittent cutting, the speed should be reduced 35 per cent from the value obtained for cutting with a lubricant.

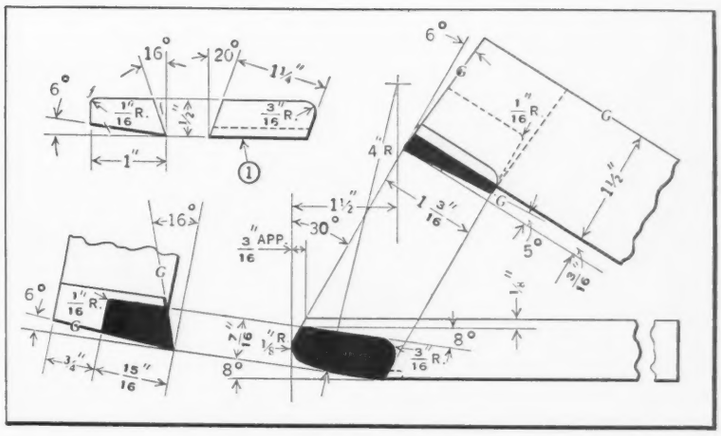


Fig. 2. Detail Working Drawing of a Tipped High-speed Steel Cutting Tool

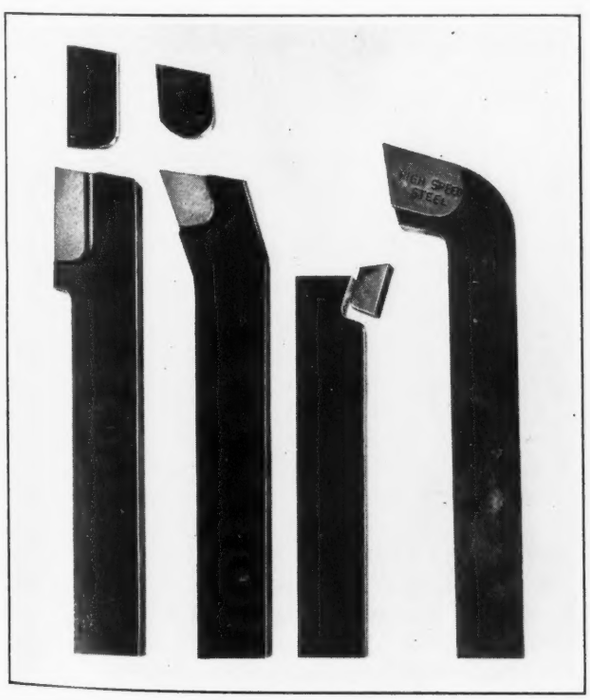


Fig. 1. Three Forged Tool Shanks with Tips to be Welded on and One Tool with Tip Welded in Place

How Long Should a Tool be Used without Regrinding?

While there has been much discussion of the comparative values of the materials of which metal-cutting tools are made, little has been done to determine the relationships of cutting speeds, tool life, feed, and depth of cut in various materials with different tools since the experiments reported by F. W. Taylor twenty-five years ago. The data usually available on tool steel, Stellite, tungsten carbide, and tantalum carbide are generally taken from high performance tests made under the most favorable conditions. The records of such performance tests are of little value unless the details of the tests are known.

When the user of cutting materials wishes to know what a certain material will do, the best way to find out is to run his own tests and secure his own data. Few shops are willing to do this, however, and not many have the necessary equipment for running such tests on a laboratory basis, even though it is possible to do the work in the regular machine shop. Thus only a few of the large manufacturing plants have any reliable comparative data on the properties of cutting tool steels.

The writer has found that the most desirable combinations of speeds and feeds for a given cut are seldom used by the machine operator, unless he is provided with definite information and special

instructions. Charts giving the standard speeds and feeds should be made up and given to a time-study man. To make full use of any charts of speed and feed data, the information should be so presented that it can be used directly in setting speeds and feeds. Of course, in making up charts, it must be remembered that the spindle speeds and feeds on a 36-inch vertical mill will not be the same as on a 72-inch mill. Cutting speeds should be established on the basis of some standard tool life time, as explained in the following paragraph.

Under present-day production methods, tool life has become the subject of much discussion. Some claim that 1 1/2 hours cutting time per grind is good tool life, others that 1 hour meets the requirements of the ordinary machine shop better than any other period. The author believes, however, that the most economical tool life is 40 minutes per grind. There are very few production jobs that require a cut consuming more than 40 minutes time. It is good practice to dress up the tool before starting a roughing cut of any length.

Determining Economical Practice for Finishing Cuts

The life of finishing tools depends largely upon the amount of stock the tool is required to remove. Some machine operators can grind a finishing tool so that it will produce a higher degree of finish than others. A good finish on products made from cast iron, semi-steel, malleable iron, and bronze can be produced with a much deeper cut than is possible when cutting steel. The depth of cut for the latter material should be about half that used for the other materials.

The constants in Table 2 were used in determining the speed for finishing cuts as outlined in Table 4. The constants are given primarily for the benefit of those who have had little or no experience with some of the more recently developed cutting materials which are capable of operating at very high speeds. Most machine operators and tool application men know how to select the most economical cutting speed for the conventional grade of high-speed steel or tungsten high-speed steel tools. As a rule, however, the high speeds attainable with the more recently developed cutting materials listed in Table 2 are not generally known. This information, therefore, should be very useful in setting speeds for these cutting materials when used for both rough- and finish-cutting operations.

Selecting the Most Economical Combination of Feed, Speed, and Depth of Cut

In machining any part, a choice between several different combinations of speed, cutting depth, and feed is usually possible. It often happens that the finish and accuracy obtained are equally satisfactory when any one of several possible combinations is used. However, there may be a considerable difference in the amount of metal removed per minute by the different combinations. It is chiefly for this reason that the tool chart shown in Fig. 3 has been developed. By the aid of a straightedge, comparisons between the several combinations of speed, depth of cut, and feed can be made rapidly, and the combination showing the fastest metal-removing speed can be selected.

Factors such as finish must, of course, be considered, and consequently the chart will be found to be most useful when applied to rough-turning. Nevertheless, even on finish-machining operations, it is often of considerable advantage to remove metal as fast as possible without unduly sacrificing the quality of the finish. The surface speed for given diameters of stock and the revolutions per minute for a given surface speed can also be read from the chart.

In using the chart, a celluloid straightedge or triangle with a straight line scribed upon it and a few holes drilled on the line through which pins may be placed to be used as pivots will be found a great convenience. The following example will illustrate the application of the chart.

Example—The work to be turned is 1.5 inches in diameter, the feed per revolution 0.015 inch, the depth of cut 0.25 inch, and the speed 100 revolutions per minute. What is the cutting speed, in feet per minute, and how many cubic inches of metal are removed per minute, approximately, according to the chart?

Answer—The procedure in solving this problem by the use of the accompanying chart is as follows:

(A) Place rule on 1.50 of line 6 and on 100 on line 5 and note that the cutting speed as indicated on line 4 is 40 feet per minute.

(B) Keeping the point on line 4, place rule on 0.015 of line 1 and on 0.25 of line 2, and locate the point of intersection on reference line 3.

(C) Place rule on the point of intersection on reference line 3 and on the point representing a cutting speed of 40 feet per minute on line 4. Now the point of intersection on line 7 shows that the number of cubic inches of metal removed per minute equals 1.8, approximately.

* * *

Standards Association Assumes Greater Scope of Work

Announcement has been made of the transfer of some of the standardization functions of the National Bureau of Standards (a subdivision of the Department of Commerce) to the American Standards Association—a federation of thirty-seven national technical societies, trade associations, and governmental bodies, with headquarters in the Engineering Societies Building, 29 W. 39th St., New York City. The activities of the National Bureau of Standards that have been transferred are the Divisions of Trade Standards, Specifications and Simplified Practice, and the Safety Code, the Building Code, and the Plumbing Code sections of the Building and Housing Division. This transfer greatly increases the scope of the Standards Association.

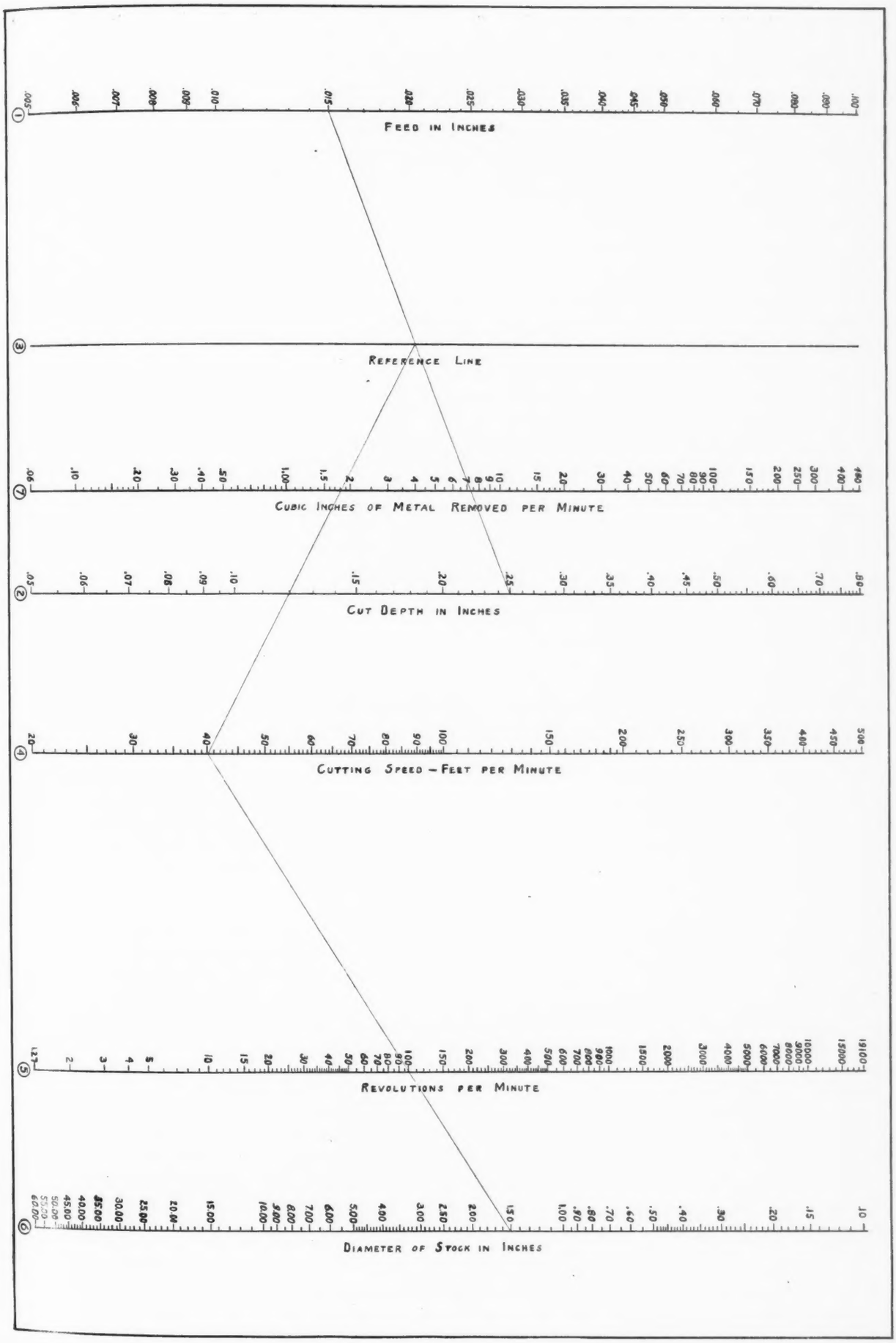


Fig. 3. Chart for Determining Most Economical Combination of Feed, Speed, and Depth of Cut

EDITORIAL COMMENT

When we say that the standard of living in the United States is higher than in any other country in the world, what do we mean? We mean that there are available for the use and enjoyment of each individual more of the products of the soil, more of the products of industry, and more and greater comforts than elsewhere. Briefly, we mean that, as a whole, the American people eat better food, wear better clothes, live in better houses, travel more comfortably, have more automobiles, more radios, and, in general, more diversified opportunities for recreation than the great mass of the people of other nations. Education, too, is within easier reach of a greater number of people here than elsewhere. This greater abundance of opportunities and of products for the use and convenience of the inhabitants of the United States has been made possible by machine production. It is because machinery can produce more than hand labor that the standard of living has been raised to a higher level here.

It is More, Not Less, Efficiency that Raises the Standard of Living

Has the standard of living in the United States now reached the highest possible level? Decidedly, no! By increasing the efficiency of machinery, it is possible to raise the standard of living to still higher levels—that is, we can produce still more of the goods and the comforts that make life easier and more convenient.

Now that we are starting to move the wheels of industry again, let us thoroughly appreciate the fact that our problem is not one of limiting the efficiency of production, but rather one of distributing the products of industry and agriculture so that the standard of living throughout the entire nation can be steadily raised. This is done by making the wages of labor large enough so that labor can buy the products of farm and factory; but wages cannot be raised indefinitely unless there is a corresponding increase in the production of labor; and that increase is mainly obtained by the use of more efficient machinery.

In an excellent review by George W. Gray, entitled "The Nation's Mighty Resources," recently published in the *New York Times*, the tremendous natural wealth of this nation was briefly summarized. The problem that we are now beginning to solve is that of making proper use of these natural resources for the benefit of the nation as a whole. In carrying out this program, it would be unfortunate if, because of our present difficulties, it were deemed advisable to put a brake on the efficiency of industrial or agricultural operations for fear that we might produce too much. Instead, let us concentrate our efforts on creating such conditions that our population may be able to consume the products of an efficient industry.

It is improved machinery and higher efficiency that has made the American standard of living possible. It is still further improved machinery and still greater efficiency that will raise this standard of living to even higher levels.

Recently our attention was called to a condition in the special machinery and tool industry that is seriously undermining the very foundation upon which this industry is built—the availability of highly skilled machinists and toolmakers. In some parts of the country a pernicious practice has been developed in the tool shops under the name "contract system." Previous to the depression, this system was used, in some instances, to the advantage of both employer and employe; but, like everything else, it can be abused, and during the depression years it has been so applied that conditions wholly unsatisfactory to everybody concerned have been created.

Contract System of Wage Payment Does Not Work Well Now

As a result, tool shops have taken work at prices far below what would adequately pay for labor, materials, and the use of equipment. This work is let out to the toolmakers and machinists on a contract plan, the result being that in some cases the wages have been so low as to preclude even a bare living, a condition to which Mr. C. B. Cole testifies in his article on page 12.

This condition may not be general, but it exists in several centers; and the sooner the tool industry can get away from this method, the better. It is ruinous alike to the industry and to the men engaged in it. As a result, many highly skilled men have found employment in entirely different occupations, and the skill that they have acquired through long years of training in the industry is completely lost. Others have completely lost faith in their trade, and consider that it gives them nothing that they cannot get through charity. They are becoming disheartened and demoralized.

The tool industry needs to conserve its skilled man power, for the day is probably not far away when increasing business activity will bring about a scarcity of highly skilled men in the specialized machinery and tool field.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Double Lever Mechanism Provides Synchronized Strokes of Unequal Length

By L. KASPER

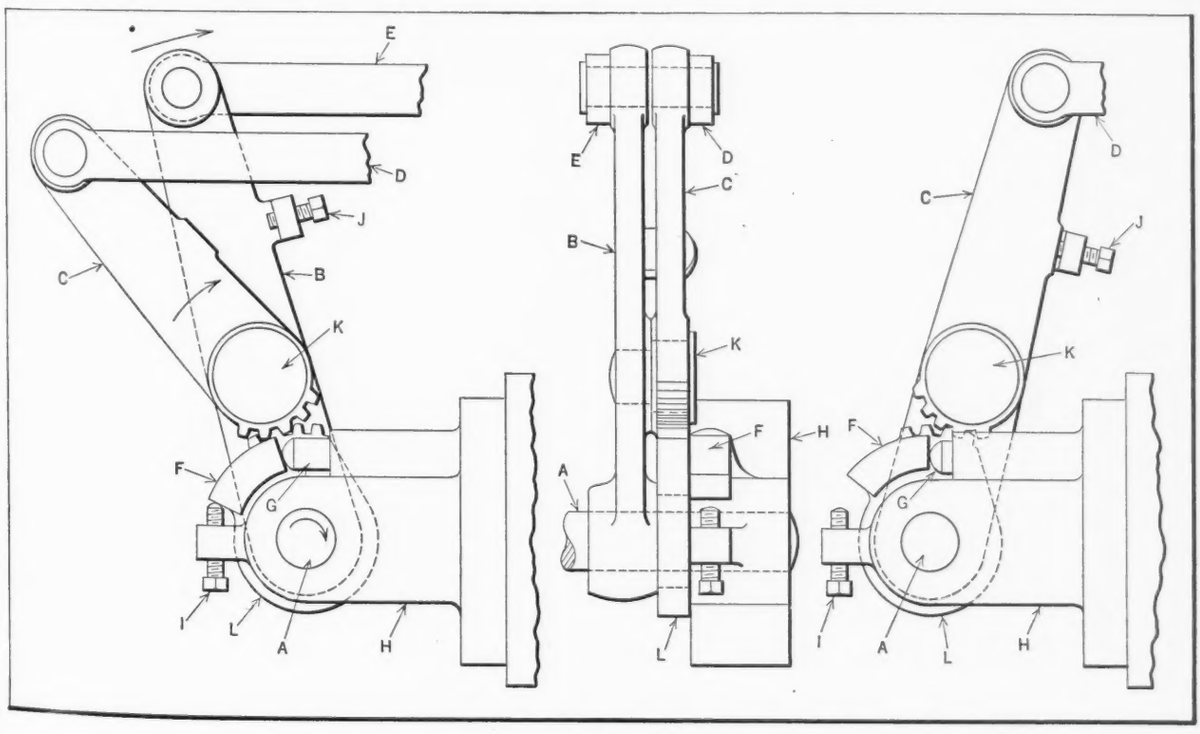
The mechanism shown in the accompanying illustration fulfills an unusual requirement in a simple manner. Two slides of a wire-forming machine were required to operate with different lengths of travel, the slide having the longer travel being arranged to operate in synchronism with the other during a portion of its stroke. Adjustability, both as to the length of travel and the period of synchronization, was also required on the slide with the longer travel.

Referring to the illustration, bearing *H* carries the shaft *A*, which is given an oscillating motion by a cam-operated lever (not shown). The motion of shaft *A* is transmitted to lever *B*, which is keyed to it. Rod *E* transmits the motion of lever *B* to one slide, and rod *D* transmits the motion of lever *C* to the other slide. Lever *C* oscillates on stud *K*, carried on lever *B*, and has gear teeth cut on the end.

The gear teeth on lever *C* mesh with teeth cut in disk *L*, which is carried free on the hub of lever *B*. Disk *L* carries a pad *F*, which is in constant contact with plunger *G* in bearing *H*. Plunger *G* is backed up by a stiff spring. The action of plunger *G* against pad *F* tends to hold the pad down against the screw *I*.

As the shaft *A* rotates in the direction indicated by the arrow in the view to the left, lever *B* is carried in the same direction, but disk *L* is restrained from movement by the pressure of plunger *G* against pad *F*. This causes the gears to operate, so that the lever *C* is swung on stud *K* in the direction of the arrow. Rod *D* is thus given the combined movement of lever *B* and lever *C*, which continues until lever *C* makes contact with the stop-screw *J* on lever *B*. At this point, lever *C* is restrained from further rotation on stud *K*, and continued movement of lever *B* causes disk *L* to be carried around with it, due to the locking action that takes place between the gears and screw *J*.

As soon as disk *L* turns with lever *B*, levers *B* and *C* revolve around a common axis—the center



Mechanism for Operating Slides of Wire-forming Machine

of shaft *A*—and they move in synchronism from that point on. The view to the right shows the levers *B* and *C* in their extreme forward position, while an end view of the mechanism in the same position is shown by the central illustration.

On the return stroke, synchronism is maintained until pad *F* again makes contact with screw *I*, at which time the movement of lever *C* is increased by the action of the gears. Screw *J* controls the period of synchronization, while screw *I* controls the travel of lever *C*.

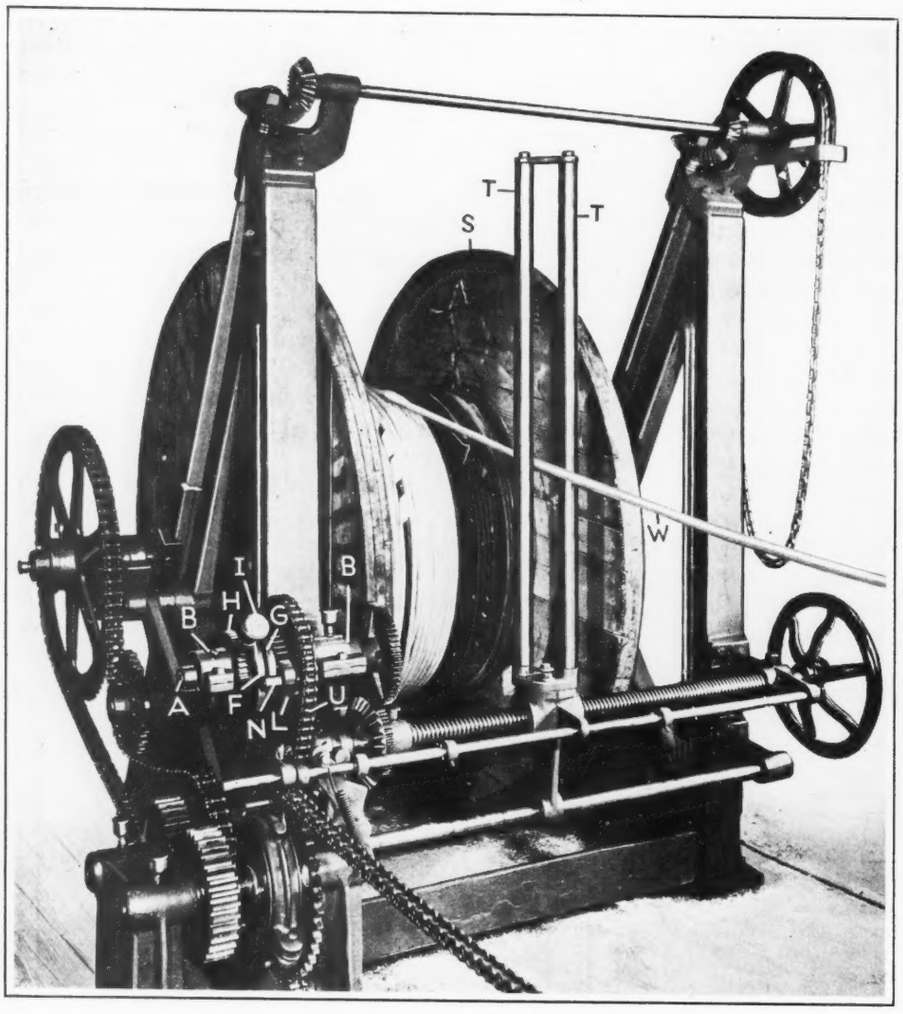


Fig. 1. Mechanism for Winding Electric Cable on Wooden Drum

Variable-Feed Mechanism for Cable-Winding Guide

By CHARLES HAGGERTY

In winding electric cable on large wooden drums, such as shown at *S*, Fig. 1, it is necessary for the cable *W* to be guided back and forth between the sides or flanges of the drum, in order to keep the windings even and closely spaced. The rate at which the guide travels must be adjusted to suit the size of the cable. The rate of guide feed per revolution of the drum is kept constant; that is, the guide must advance 1/2 inch per revolution of the drum in winding a 1/2-inch cable, for example, regardless of the reel diameter. As the reel fills up, the friction drive slips, allowing the drum and guides to slow down in order to maintain a uniform winding speed.

The mechanism shown in the accompanying illustrations permits the rate of feed of the guide bars *T*, Fig. 1, to be varied without stopping or interrupting the winding operation. Figs. 1 and 2 also show the clutch and gear arrangement for automatically reversing the direction of travel when the guide reaches either end of its traverse. The mechanism has been used successfully for the last eight years in several electric cable factories.

The complete drive to the winding drum and the winding guide is easily traced in Fig. 1, while the lead-screw drive and reversing mechanism for guides *T* are clearly shown in Fig. 2. The shaft *A*, Figs. 1 and 2, of the feed-varying mechanism is driven by the chain *U* and has its bearing in bushing *C*, Fig. 3, and the hub of cam-plate *G*.

Bushing *C* and cam-plate *G* are securely held in bearings *B*. Sprocket *D* runs continuously on bushing *C*. Pivoted on sprocket *D* are pawls *L* with rolls *N*, which are held in contact with cam-plates *G* and *F* by springs *O* attached to the sprocket hub.

Half of the rim of each of the cam-plates is high enough to lift the pawls clear of the ratchet *R*, and the other half of each rim is low enough to permit the pawls to engage the ratchet. The movable cam-plate *F* can be swung into position by lifting knob *J*, and it is held in place by releasing the spring plunger *J*, so that it will mesh with the teeth in gear segment *H*, which is fixed to cam-plate *G*.

When cam-plate *F* is so positioned that its contour coincides with that of cam-plate *G*, the pawl roll, riding on the lower portion of the cam-plates, will allow the pawl to engage a tooth in the ratchet and carry it around half of a revolution before the roll rides up on a higher portion of the cam-plate rim, thus disengaging the pawl.

By moving cam-plate *F*, the extent of the low

surface in contact with the rolls is reduced and the high surface increased, consequently reducing the rotary motion given the ratchet per revolution of the sprocket *D*. Obviously, this gives shaft *A* an intermittent motion, which must be considered in the application of the mechanism.

* * *

A Business Executive Commends The Industrial Recovery Act

The following statement made by a successful executive who has spent his entire life in operating businesses to make a profit is quoted by *Automotive Industries*.

"No one has come forward with any better suggestion or compromise between further drastic deflation and wild inflation than that which is afforded by the Industrial Recovery Act. The Administration gives organized industry every opportunity of working out its own salvation by mutual agreement within trade associations. It sets up conditions under which destructive minorities can be controlled by constructive majorities.

"Industry either must accept the challenge and prove its ability to conduct its own affairs, or look forward to complete socialization of industry, with a possible interim of unspeakable confusion and the possible development of communism.

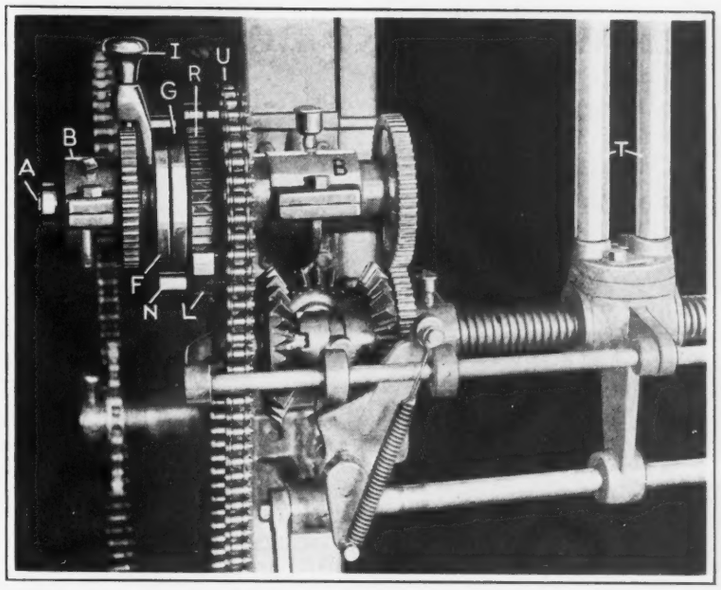


Fig. 2. Close-up View of Mechanism for Driving Guides T, Fig. 1, and for Adjusting their Rate of Travel or Feed

"Let us approach the appointed task with the solemn thought that we are about to discover whether the joint forces of democratic government and collective industry can be so marshalled and directed as to control constructively the great economic forces which have, in some measure, been set in motion by these same agents."

If the majority of manufacturers take this attitude, the success of the "new deal" is assured.

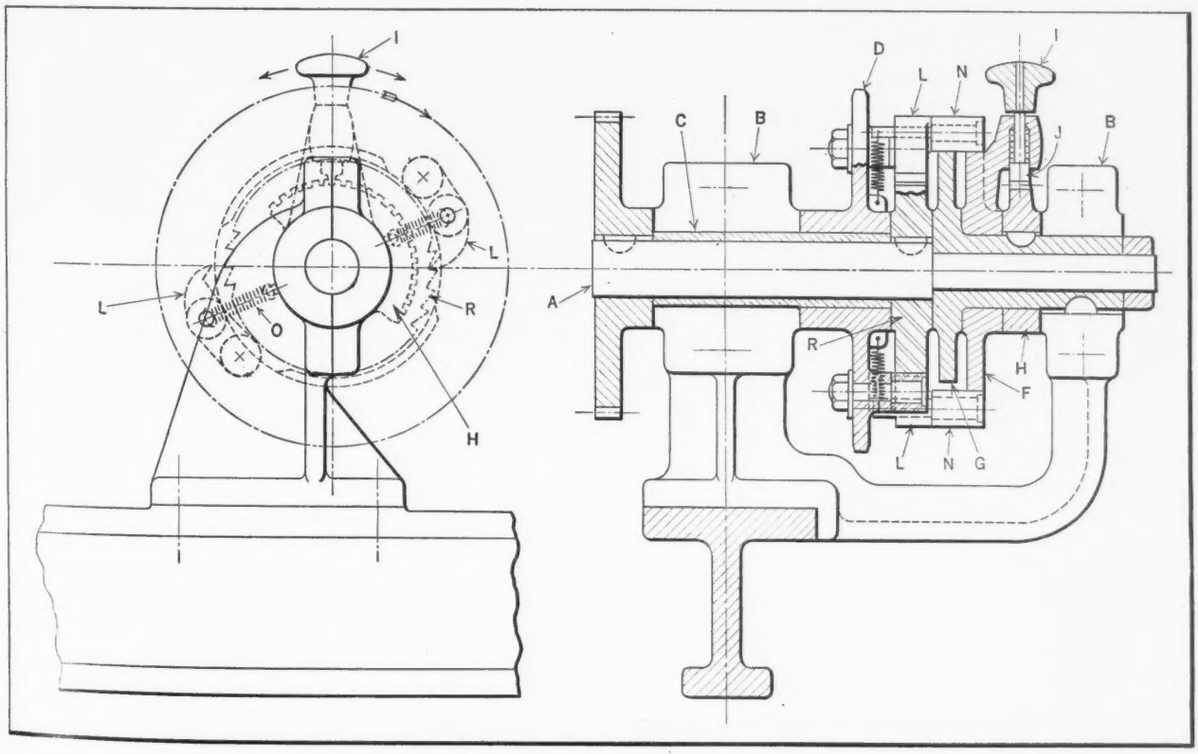


Fig. 3. Assembly View of Mechanism for Adjusting Rate of Feed for Guides T, Fig. 1

How to Make an Accurate Multi-Spline Gage

Difficulties in Obtaining Precision Spacing of the Blade Slots are Overcome by a Simple and Ingenious Method

By WILLIAM C. BETZ, Master Mechanic
Fafnir Bearing Co., New Britain, Conn.

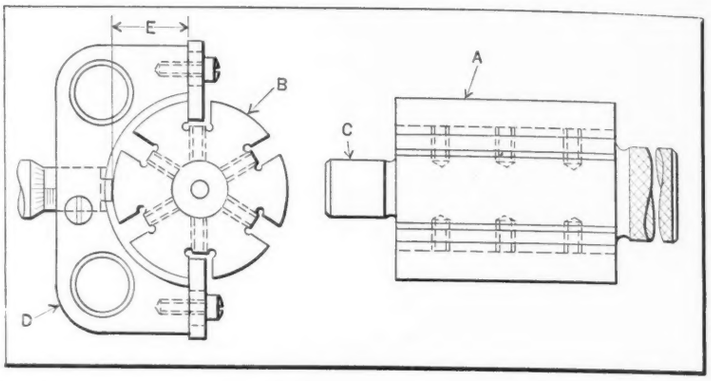


Fig. 1. Body of Typical Multi-spline Gage with Micrometer Gage for Checking the Central Position of the Slots

UNLESS special equipment is available for indexing and gaging, the grinding of the blade slots in multi-spline gages to obtain accurate spacing is a rather difficult operation. The body of a gage of this type is shown at *A*, Fig. 1. It is machined in the usual manner, and the holes for holding the blades in position are drilled and tapped using a strip of metal as a jig. This jig is also used for drilling the body holes in the blades. After hardening, the body is ground at *B* and *C*. The knurled handle is also trued up with the grinding wheel, as this handle is used later for centralizing the gage body in grinding the sides of the blade slots. Special gage *D* is provided with a micrometer head for checking the distance *E* in this grinding operation.

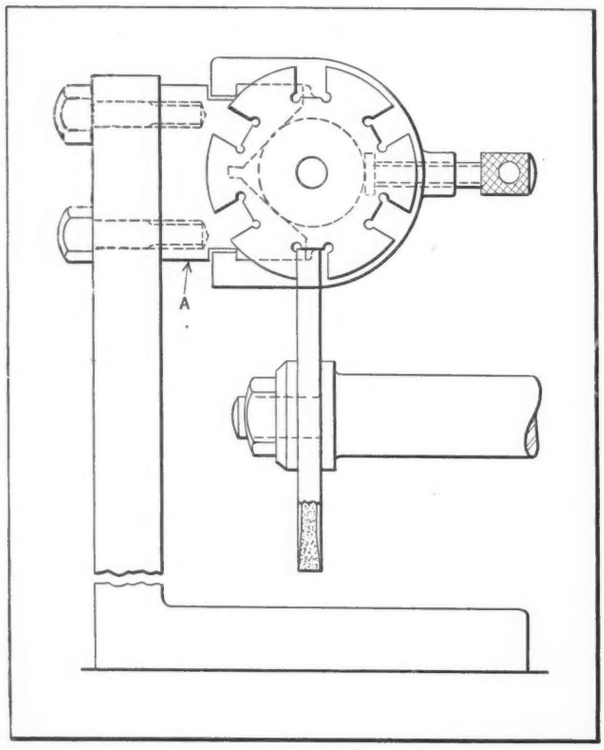


Fig. 2. Set-up for Grinding the Corresponding Sides of Opposite Slots at One Setting

In grinding the blade slots, an accurate V-block *A*, Fig. 2, is mounted on an angle-plate with the vee set exactly parallel with the surface of the grinder table. The handle of the gage body is then clamped in the vee and two opposite blade slots are lined up vertically. As the corresponding sides of opposite slots must be in exact alignment with each other when finished, they must be ground at one setting. This is done by grinding one side of the lower slot with the top of the wheel, as indicated, and the corresponding upper slot with the bottom of the wheel. After these two sides are accurately ground, the table is fed over and the opposite faces of the slots are ground. In this way, by using gage *D*, Fig. 1, one pair of slots is finished exactly central with the axis of the gage body.

Simple Ring Gage Used for Precision Spacing

To facilitate spacing the next pair of opposite slots, a gage ring *A*, Fig. 3, is used, in conjunction with the plugs *B*, *C*, and *D*. This ring has six accurately spaced holes with diameters equal to the width of the finished blade slots, and a center hole which is a slip fit on the pilot of the gage body. The plugs are a snug lapped fit in the small holes. Two of the plugs *B* and *C* have flats ground near their ends and are used as feelers for determining the amount of stock to be removed from the sides of the slots during the grinding operation. Plug *B* has one side flattened off 0.015 inch, and the opposite side 0.006 inch. The other plug *C* has a 0.015-inch flat on one side and a 0.001-inch flat on the opposite side.

In grinding the second pair of slots, the ring is slipped on the pilot *C* of the gage body and two full-diameter plugs *D* are passed through opposite holes in the ring and into the two finished slots. The gage body is now rotated in the V-block until the holes in the ring opposite the slots to be ground are aligned exactly vertically. This is done without

removing the plugs *D* from the finished slots, by means of a try-square held against two similar plugs in the two holes opposite the slots to be ground. After clamping the gage body, the plug *B* is inserted in the upper hole in the ring and the end of the 0.015-inch flat pushed against the end of the slot to be ground. The approximate amount of stock to be removed is then noted.

The ring and plug are now removed, and the corresponding sides of the opposite slots ground in the manner described for the first pair of slots. As the stock is gradually being removed, the different flats on the plugs are tried to insure that too much stock will not be removed.

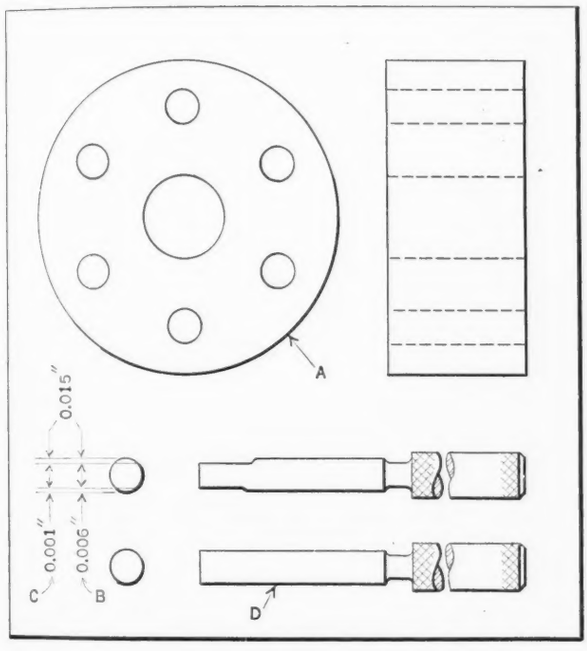


Fig. 3. Ring Gage and Plugs Used for Accurately Indexing the Spline Gage

Regular leaf-feeler gages can also be used in conjunction with plugs *B* and *C*. This alternate grinding and gaging is continued until the cylindrical surface of plugs *B* and *C* enters the slot with the 0.015-inch flat on the unfinished side of the slot. The opposite faces are then ground to size. The remaining pair of slots is ground in a similar manner.

After the sides of the slots are finished, the bottom of each slot must be ground. This is done on a magnetic chuck, as indicated in Fig. 4, by resting the gage body on the edges of one slot. The body is lined up with a magnetic parallel fastened securely to the chuck by straps. Another parallel, placed on the opposite side of the gage, and the two small straps *A* serve to hold the gage firmly in place.

The blades are finished by grinding on the bottom, and grinding and lapping on the sides. After they have been assembled in the gage body, the gage is placed in the cylindrical grinder and the outer diameter of the blades is ground to size.

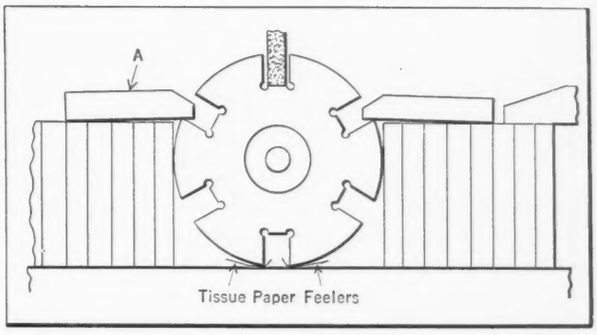


Fig. 4. Set-up for Grinding the Bottom of the Slots. Magnetic Parallels Aid in Holding the Gage Securely

Equipment Used for Making Final Inspection of Slots in Gage Body

For final inspection of the slots in the gage body, the method shown in Fig. 5 may be used. An accurate dial indicator, mounted on a heavy surface gage base, provides a rapid means for doing this. The principle involved is very similar to that of the gage shown in Fig. 1 and is self-explanatory. If desired, the pilot *C*, Fig. 1, may be cut off with a narrow rubber bond wheel after the gage has passed inspection.

It might be mentioned that if an optical dividing head is available, much of the foregoing work can be eliminated. With this device, accurate spacing of the slots would be insured and it would be necessary only to keep the opposite sides of the slots parallel with each other. One side of each slot would first be finished and then the opposite side, the top and bottom of the wheel being used as previously described.

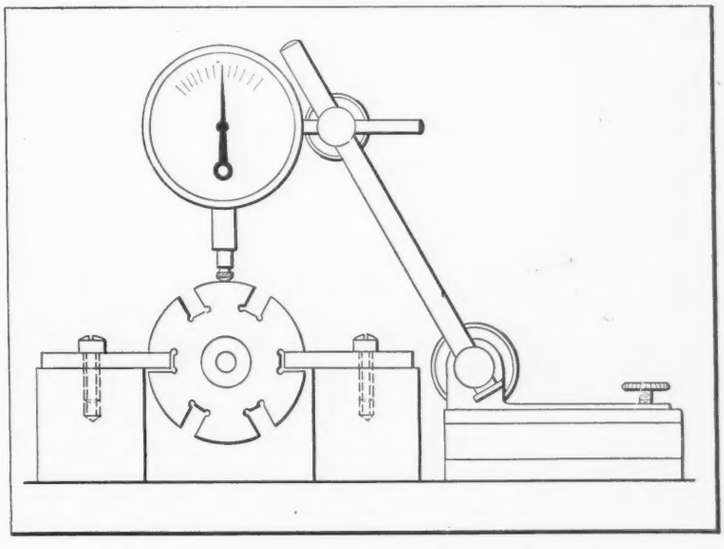
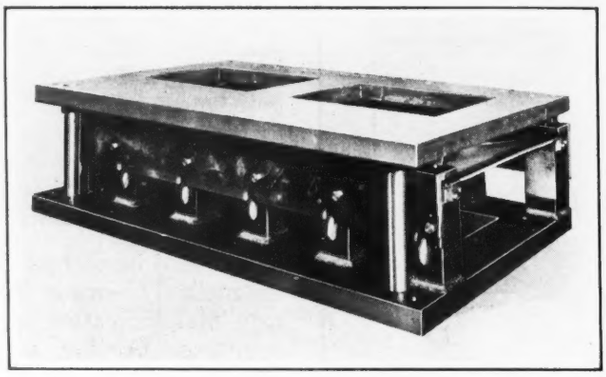


Fig. 5. A Rapid and Accurate Method of Checking the Finished Spline Gage

Welded Construction Cuts Cost of Perforating Dies in Half

By C. M. TAYLOR, Vice-President
Lincoln Electric Co., Cleveland, Ohio

Welding by means of the shielded-arc process, introduced several years ago, has made remarkable progress in the field of machinery manufacture. Production costs have been greatly reduced in many plants by its adoption, and certain parts are now built almost exclusively by welding. Other parts that could just as logically and economically be redesigned for welding are still made in the old way, chiefly because no one has demonstrated the advantages of the new method by actual application.



Perforating Die of Arc-welded Construction Weighing 3000 Pounds that has Successfully Withstood Loads up to 350 Tons

At the plant of the Cleveland Tractor Co., Cleveland, Ohio, a large number of dies are used for punching holes in various steel parts for tractors. Until the last year, dies of cast-steel construction were used for this purpose. As the company had been using the shielded-arc welding process successfully for some time and had made tests showing the remarkable strength of the welds, it was decided to build all the die-shoes of welded construction.

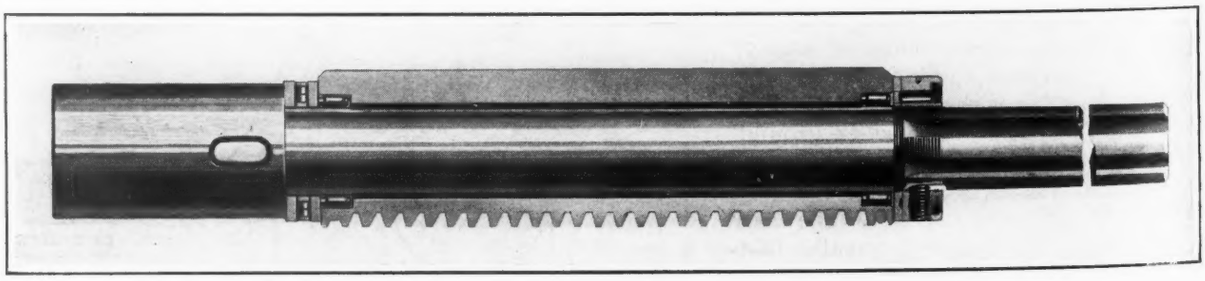
So far, twelve dies of various sizes have been built by this method, under the direction of Fred Gruber. These dies have proved highly satisfactory. One of the larger dies is shown in the accompanying illustration. This die is used in a Bliss No. 12 brake for punching twelve 3/4-inch by 1-inch elongated holes in 1/2-inch stock. The punched pieces each weigh about 300 pounds and form the sod pans for large tractors.

The die illustrated is 33 1/2 inches wide and 52 1/2 inches long. The base of the die-shoe is built of 2-inch boiler plate to which were welded twelve 3 1/2- by 3 1/2- by 7-inch die posts. The bottom edges of the die posts were machined to form a V-groove for welding. All welding was done by the shielded-arc process, using equipment manufactured by the Lincoln Electric Co., Cleveland, Ohio. The die-plate is bolted to the top of the die post to permit the plate to be removed for machining or for the insertion of new bushings.

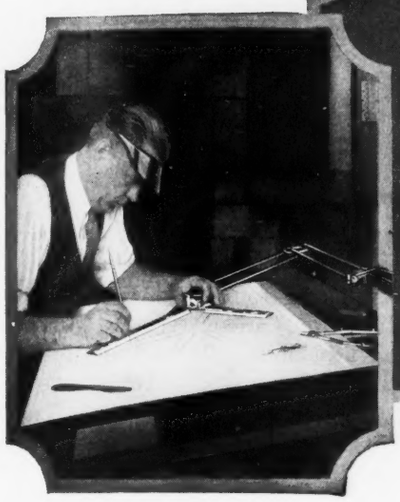
The total weight of this welded die and die-shoe is approximately 3000 pounds, which is less than half the weight of a cast-steel die and die-shoe made for the same work. The total cost of construction by the welding process was estimated to be less than the cost of patterns required for a casting. These dies have had to carry loads up to 350 tons, but none has shown any indication of weld failure. In addition to the fifty per cent saving in the cost of construction, there is the advantage of lighter weight, saving in the time required for construction, and greater shock resistance of the material.

* * *

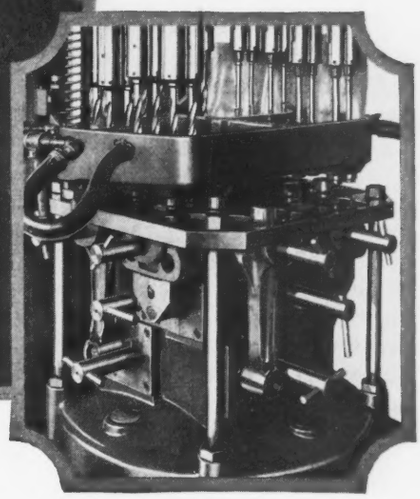
In a paper read before the last annual meeting of the Society of Automotive Engineers, Herbert Chase suggested that automobile designing engineers should be required to clean, lubricate, and otherwise care for their own cars. If this were a requirement that no automobile designing engineer could side-step, in Mr. Chase's opinion, automobiles would be designed so that everything would be more accessible.



The Spindle and Sleeve of a Drilling Machine Built by the Barnes Drill Co., Made from Nitralloy. Both Spindle and Sleeve are Hardened after Grinding by the Nitriding Process, without Warpage or Shrinkage, Making a Surface Much Harder than by Ordinary Casehardening and Leaving a Very Strong Center Core. The Spindle Rotates on Roller Bearings with No Raceways, the Rollers Bearing Directly on the Hardened Surfaces of the Spindle and Sleeve.



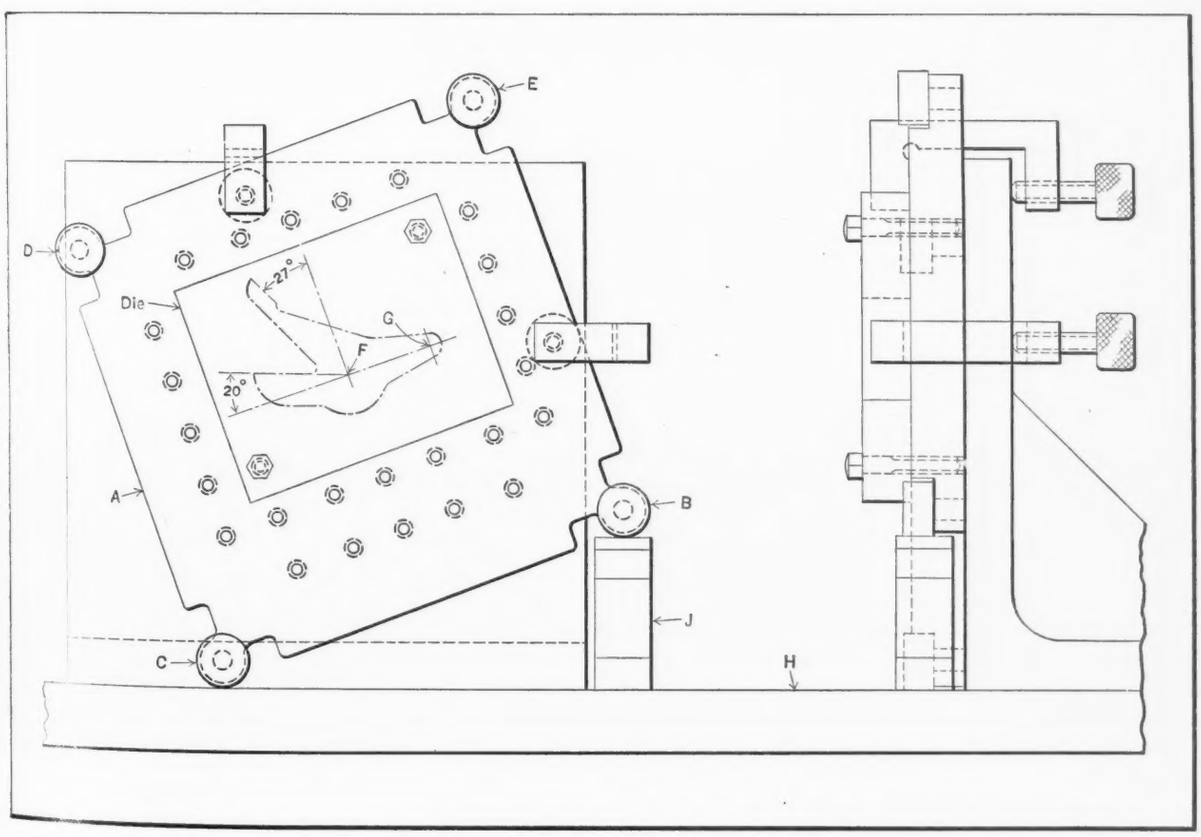
Design of Tools and Fixtures



Four-Point Sine Plate for Rapid and Accurate Lay-Out Work

By ADRIAN E. MOUGEY, Dayton, Ohio

A high degree of accuracy can be obtained in laying out or checking angles in the tool-room with ordinary types of sine bars. Nevertheless, one of the objections to these bars is that they must be readjusted or set up for each angle; and this, in itself, often leads to an accumulative error. Also, an appreciable amount of time is consumed in making the readjustments. However, with the four-point sine plate shown in the illustration, a great deal of time is saved because the work being laid out remains fastened securely to the sine plate



Four-point Sine Plate for Accurately Laying out or Checking Several Angles and Intersecting Points without Disturbing the Setting of the Work

until it is entirely laid out. This is true, regardless of the number of angles involved or the direction in which the measurements of the intersecting surfaces are given on the drawing; consequently, there is little chance of error.

The sine plate illustrated consists essentially of the body *A* and the four buttons *B*, *C*, *D*, and *E*. The body is made preferably from a piece of well seasoned cast iron. It is finished all over, extreme accuracy being required in finishing the four edges square and in boring the holes for the buttons. A series of holes is tapped in this plate to facilitate the clamping of different work. Incidentally, the buttons are tool steel, hardened and ground with great precision. The size of the plate is governed by the type of work for which it is to be used. It is advisable, however, to make the center distances of the buttons in multiples of 5 inches, so as to simplify the calculations involved. The center distance for the plate shown is 10 inches.

As indicated, the sine plate is being used in conjunction with an angle plate and a surface plate for laying out a die opening for a part having several angular projections. In starting this lay-out, the die is fastened to the plate by two screws which engage corresponding tapped holes in the plate. The starting points for laying out the opening are the centers *F* and *G*. At this time, the buttons *C* and *B* are resting on the surface plate *H*. After locating the point *F*, a horizontal line is scribed through it. Plate *A* is now rotated 90 degrees, so that it rests on the buttons *C* and *D*. In this position, the point *G* is located.

To scribe the 20-degree line, the plate is swung back, with button *C* remaining on the surface plate and button *B* supported on the size-blocks *J*. The height of these blocks is determined by referring to the table of sine bar constants beginning on page 1019 of MACHINERY'S HANDBOOK (eighth edition). For a 20-degree angle, the constant or height of the size-blocks for a 5-inch bar is 1.7101 inches. Since the center distance of the buttons on the sine plate shown is 10 inches, the height of the blocks will be 2 × 1.7101, or 3.4202 inches.

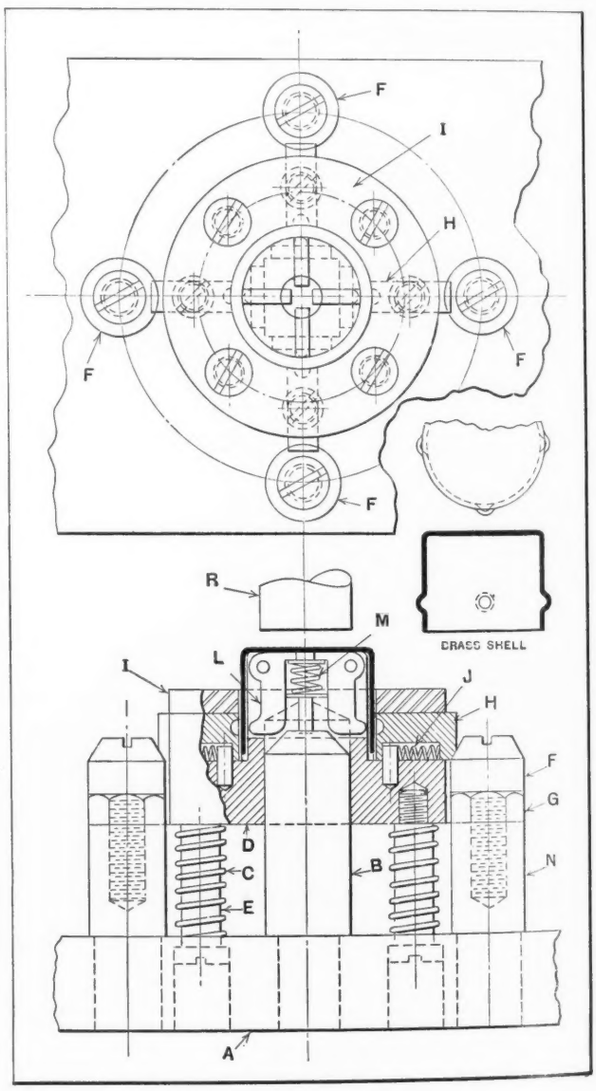
After scribing the 20-degree line, the sine plate is rotated into position for scribing the 27-degree line. To do this, button *C* remains on the surface plate and button *D* rests on size-blocks, as before. The height of these blocks is also obtained from the table of constants. In the table, the height of a block for a 5-inch bar is 2.2699 inches. Consequently for the sine plate, the height of the blocks will be 2 × 2.2699, or 4.5398 inches.

Now that the lines requiring the greatest precision are scribed, the outline of the die opening can be rapidly completed by rotating the sine plate to the different positions required, using the same two sets of height blocks but applied to different buttons. Thus, to lay off the intersecting points measured along the 20-degree line, button *B* rests on the surface plate and button *E* on the 3.4202-inch size-block. In this way, the 20-degree line will be perpendicular, so that the height of the point of the scriber can be set from a graduated square or vernier height gage. To lay off the intersecting points on the 27-degree line, button *D* rests on the surface plate and button *E* on the 4.5398-inch size-block.

Indenting Die for Brass Shells

By J. E. FENNO, Belleville, N. J.

A simple die for making four indentations in the side of a brass shell simultaneously, at one stroke of the press, is shown in the accompanying illustration. The member *D*, sliding on the center post *B* and held in its normal position by the springs *C* and screws *E*, serves as a holder for the shell. The indenting fingers *L*, swinging on pins in member *D*, are held normally in the inward position by the coil spring *M* so as to permit the shells to be loaded or



Die for Making Four Indentations at One Stroke of the Press

unloaded. The sliding dies *H* also clear the shell at this time, and are retained in their paths by four radial grooves cut in the under side of cap *I*, which is fastened by screws to the member *D*. The hardened taper-head screws *F* are screwed into the posts *N*, which are a drive fit in the die-bed *A*. The check-nuts *G* provide close adjustment for controlling or equalizing the stroke of the dies *H*.

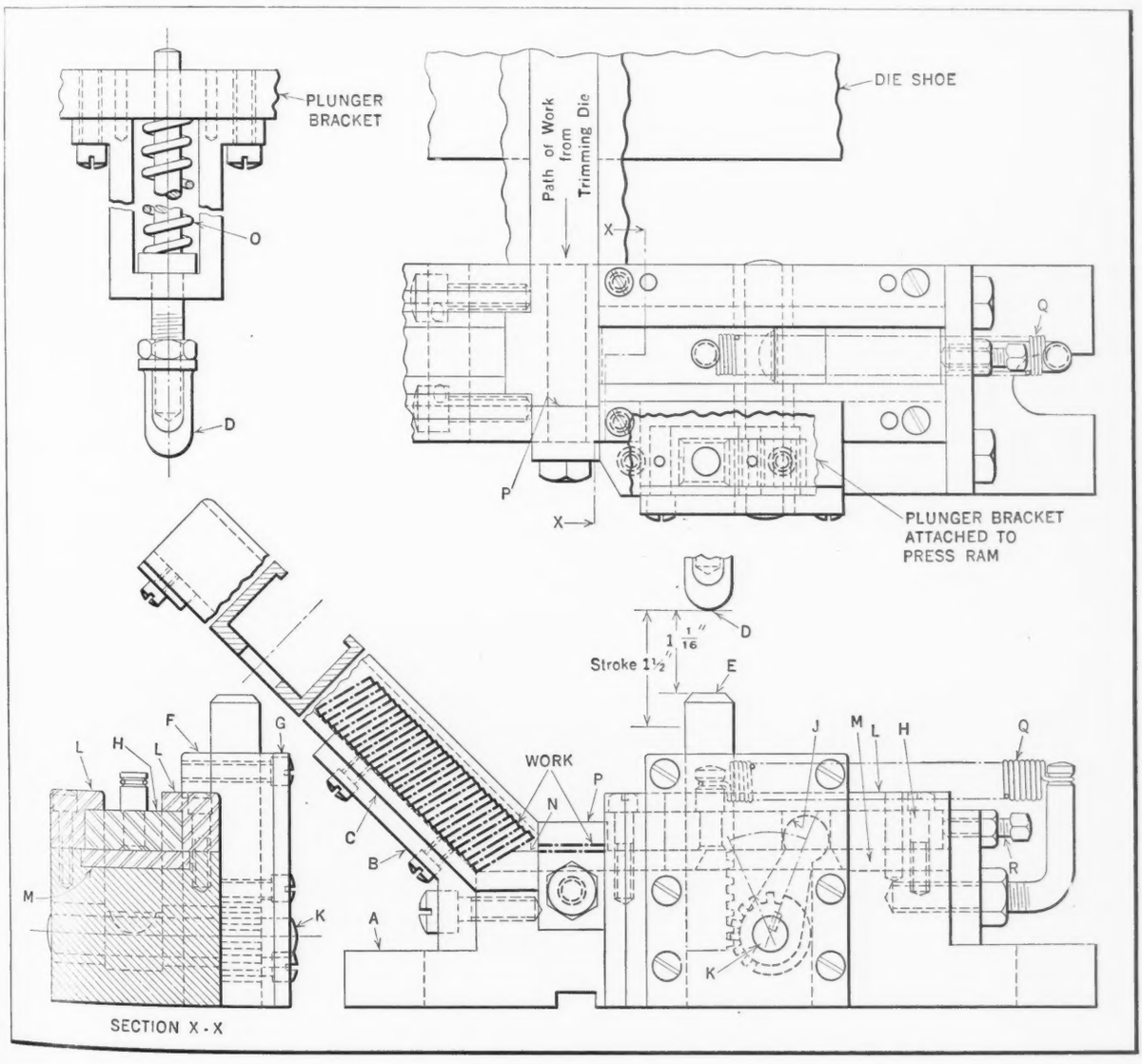
In operation, a shell is placed on member *D* as shown. As the punch *R* descends, it carries member *D* down, the taper on the screws *F* forcing the dies *H* in until they come in contact with the outside of the shell. Further downward movement of the punch brings the ends of the fingers *L* against the tapered end of center post *B*, which imparts an outward radial movement to them. This movement of fingers *L* forces the shell into the depressions in dies *H*, forming the indentations as shown in the detail view. Springs *J* return the sliding dies to the clearance position as the member *D* ascends during the upward stroke of the press.

Press Attachment for Stacking Blanked Work

By EDWARD LAY, Ozone Park, Long Island

The work-stacking device shown in the accompanying illustration is used on an automatic magazine-fed die equipped with a work-locating slide escapement (such as described in June, 1932, MACHINERY, page 739). All parts of the stacking device are of hardened and ground tool steel, with the exception of the body *A*, bracket *B*, and magazine *C*, which are made from cold-rolled machine steel. This device arranges the work or blanks shown in heavy dot-and-dash lines in an orderly stack in the magazine *C*, ready to be put into the feeding magazine of a machine that performs the succeeding operation.

The device performs this stacking operation automatically without any attention from the operator. The body *A* of the attachment is keyed to the

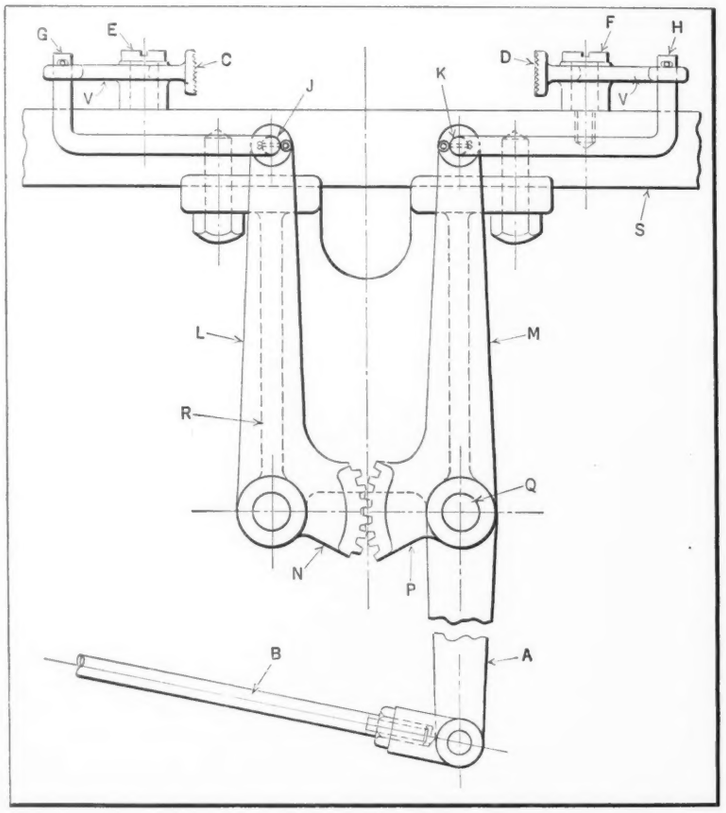


Device Used on Punch Press to Stack Work for Succeeding Operation

die-shoe and also fastened to the bolster plate with screws, in order to maintain accurate alignment with the die.

After the required operation has been performed on a blank by the trimming die, the piece is pushed along in the direction indicated by the arrow in the upper or plan view, by the action of the feeding magazine slide. This movement occurs on the last part of the upward stroke. As the press ram descends, the plunger *D* makes contact with the rack *E* on the last 7/16 inch of its 1 1/2-inch down stroke. The rack *E* is guided by parts *F* and *G*, shown in section *X*–*X*. The movement of the rack *E* transmits motion to the slide *H* through the gear and the lever *J* on shaft *K*. Lever *J* is keyed to shaft *K*, which is integral with the gear that meshes with the rack *E*. Slide *H* is guided by straps *L* and the liner *M*.

The work is pushed by slide *H* to a point where it will tip over on the inclined surface of plate *N* at the entering end of the magazine, just before the press ram reaches the end of the down stroke. By having the magazine inclined as shown, it is unnecessary to provide detent fingers, such as are generally required for horizontal stacking machines. When the press ram ascends, the spring *Q* causes slide *M* to recede. Slide *H* will be completely withdrawn to its starting position when plunger *D* has traveled upward 7/16 inch from its lowest position. This completes the cycle and clears the slide, ready to receive a new blank before the upward stroke is finished.



Lever System Used to Open and Close Opposed Clamping Pads Simultaneously

Pad *P* serves as a gage stop for locating the work in front of the feeding slide *H*. The spring *O* serves to prevent damage to the mechanism should any part fail to function properly. Precise timing of slide *H* is obtained by adjusting plunger *D* and also the set-screw *R* which limits the rearward travel of slide *H* on the return stroke of the press ram. This device is being used on quite a number of power presses equipped with automatic dies that perform a variety of punch press operations.

Lever Arrangement for Operating Two Opposed Clamps Simultaneously

By H. SCRIBER

The object of the lever arrangement shown in the accompanying illustration is to impart rocking movements in a horizontal plane to the two knurled clamping pads *C* and *D*. These pads are integral parts of levers *V*, which are pivoted on studs *E* and *F*. Rods *G* and *H* connect the outer ends of levers *V* with levers *L* and *M*. The pivot screws *E* and *F* are placed at the centers of the levers *V*, which are shaped to properly locate the clamping pads *C* and *D*.

Connecting-rods *G* and *H* are bent at *J* and *K* so as to enter holes in levers *L* and *M*. Lever *L* has a segment gear portion at *N*, while lever *M* has a similar segment gear at *P*. These segment gears cause levers *M* and *L* to operate together when lever *A* is reciprocated about stud *Q* as a center. The two levers are supported by a bracket *R*, mounted on a cross-member *S* which forms part of a machine structure.

When lever *A* is pulled to the left, the upper ends of levers *L* and *M* are spread apart, thus causing the rods *G* and *H* to swing levers *V* about the studs *E* and *F*, so that the pads *C* and *D* close in and grip the work. The reverse movement of lever *A* causes the pads to open. This arrangement is used with very satisfactory results when it is simply necessary to retain the work in place without exerting a heavy clamping pressure. It would hardly be satisfactory for heavy-duty work, due to the amount of spring in the rods and levers.

* * *

The special taxes collected from automobile and truck owners in 1932 reached the enormous sum of $1,076,000,000, or nearly 11 per cent of all taxes collected for federal, state, and local governments in the United States.

The Hot-Pressing of Intricate Brass and Bronze Parts

Smooth and Accurate Parts Having a Remarkably High Tensile Strength and Non-Corrosive Properties are Finish-Formed from Billets at 350 an Hour—A Review of British Practice

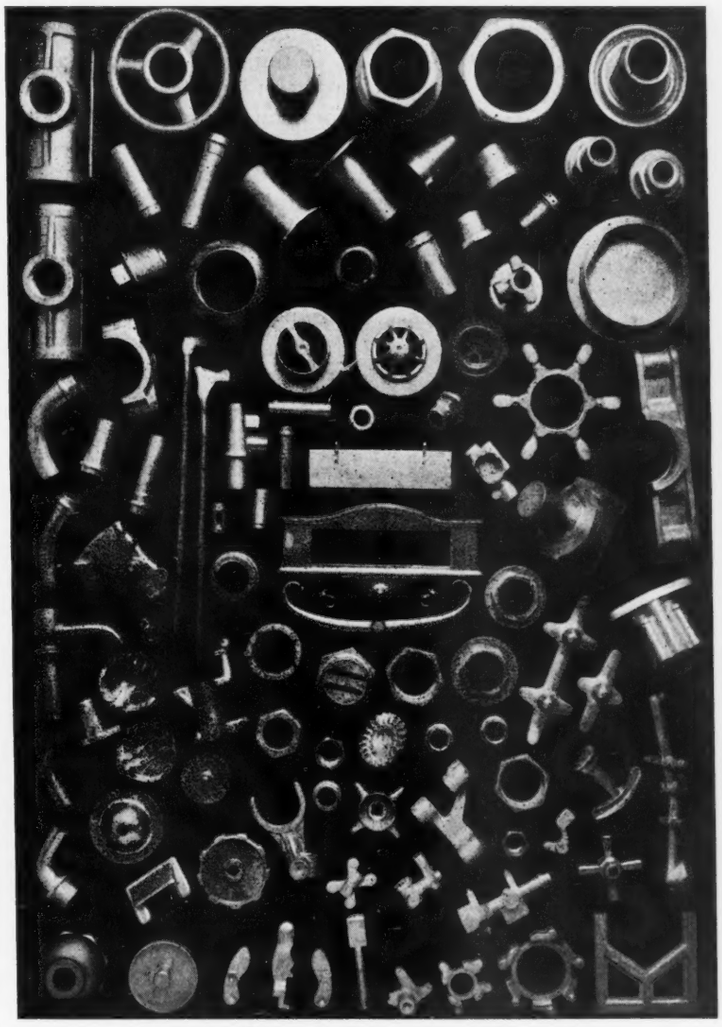
THE application of the hot-pressing process to the making of non-ferrous alloy parts in relatively large quantities has assumed an ever increasing importance. This process consists of heating a predetermined volume of the alloy and squeezing it to the desired shape between dies in a high-powered press. The accuracy obtained is within a few thousandths of an inch; thus production costs are reduced by eliminating machining operations and scrap. Plain and straight-cored parts present no difficulties, but under-cut parts or parts having outside threads are also readily made by using specially designed dies. As a rule, this process is not recommended for lots of less than 2000 heavy parts or 10,000 light weight parts. The information given in this article is abstracted from a paper read by J. Willis Beard, general manager of J. W. Singer & Sons, Ltd., before the Scottish Section of the Institute of Metals.

Even when machining operations are required, pressings have an advantage over sand-cast parts. Blow-holes, sand inclusions, and lack of uniformity in shape are often troublesome factors in the production of sand castings. This is not the case with the pressings, as they have a smooth, clean surface, are identical in shape, and are free from blow-holes. In addition, the high squeezing pressure toughens the material so that a homogeneous mass of great strength is obtained.

To bring the billets to a plastic state, they are heated in a specially designed furnace of the indirect type, using gas or fuel oil. For brass, the working temperature is about 1470 degrees F. The furnace must have a capacity for a large number of parts and be capable of thoroughly heating the parts. The lining must be a high-grade refractory; otherwise, brick dust will enter the billets and damage the dies or cause trouble in subsequent machining operations. Nickel-chromium linings are often used to prevent this.

The dies for hot-pressing consist of an upper and lower member having cavities corresponding to the shape of the finished part. Before beginning the pressing operation, the dies should be preheated to avoid chilling the work and to assist the metal to flow. Preheating also expands the die to its normal operating proportions.

Lubrication of the die cavities and the parts of the movable die members that enter the work is quite important, as otherwise the metal will adhere to the die. Among the many preparations



Parts Hot-pressed to Finished Size at One Stroke of the Press

used for this purpose are soap, graphite, tallow, lard, and oil.

A billet is placed in position in the center of the die cavity. The location is important, as otherwise incomplete shapes will result. When the top half of the die descends, the metal is squeezed to the exact shape of the part, the surplus metal forming a flash at the junction of the upper and lower die members.

The part is ejected by either a foot- or a hand-operated ejector. This must be done rapidly; otherwise the part will shrink in the die so that it will have to be forcibly ejected, which will result in spoiled work or lost time. The flash is removed in a trimming press. After the flash has been removed, the pressings are dropped into stainless steel baskets, washed in a hot water and potash bath, and finally dropped in aqua fortis, after which they are dipped in running cold water.

Precautions to be Observed in the Design and Care of Dies

The correct design of the dies is of extreme importance. It should be borne in mind that the metal will flow more readily when there is the least resistance. Therefore, dies for parts with walls thinner than 3/32 inch and having a large volume of metal elsewhere are likely to prove troublesome owing to "cold-shuts." This is the result of two streams of metal that are too cold to unite flowing together. Again, a large volume of the metal may be forced through a narrow die opening. In this case, the metal "folds over" on reaching a larger opening not yet filled, and quickly chills because it cannot be fed through fast enough. Square corners should also be avoided, as they impede the free flow of the metal. Shrinkage of the part is another factor to be considered in designing the die—especially unequal shrinkage, as this sets up stresses that might crack or break the die.

Provision for the release of air in the die is essential, as otherwise faulty work will result or the die itself may burst. Usually, the clearance allowed for the flash or the opening for the metal, if extruded, provides an outlet for the air.

Dies for plain brass parts may be made of carbon steel; but for parts requiring higher production and pressure, and having shapes sharp or intricate in outline, or requiring extrusion, cobalt and nickel-chrome, tungsten, vanadium, and manganese steels are used. The life of a die varies; in some cases, up to 70,000 pieces have been made before repairs or replacements were necessary.

Presses capable of exerting pressures of from 25 to 250 tons are essential to cover the entire range of pressings made. Two types of presses are used —the screw-driven and the crank-driven type. In the former, 350 parts per hour have been made. The latter type is more advantageous for work requiring side and bottom tools for coring, etc. These tools are brought into position just before the metal is squeezed into the die cavities.

Alloys Suitable for Hot-Pressed Parts

As a rule, pressings can be made from extruded bars, cut into billets of the required lengths, allowance being made for flash and shrinkage. However, sometimes it is better to use special-shaped sections cast in the foundry as near to the actual shape of the finished part as possible. By using these, a number of rough-forming operations are eliminated.

On account of its general utility and low cost, brass having a content of 58 to 60 per cent copper, up to 2 per cent lead, and the rest zinc is the most suitable non-ferrous metal for hot-pressing operations. It has a tensile strength of 23 to 28 tons per square inch, and 25 to 30 per cent elongation. Incidentally, this metal is used for 80 per cent of the parts made by this process. It is pliable and will readily take intricate shapes with well defined outlines.

Another alloy suitable for hot-pressing is Naval brass, comprising 61 per cent copper, 1 per cent tin, and the balance zinc, the total impurities not exceeding 0.75 per cent. This material has a tensile strength of 22 to 26 tons per square inch, and an elongation of 20 to 25 per cent. Its specific gravity is 8.38, and as it resists the corrosion of salt water, it is used in connection with shipbuilding.

Manganese bronze has a high tensile strength and can be used in hot-pressed form as a substitute for iron and steel. It contains 58 per cent copper, up to 1 per cent lead, 1 per cent manganese, 0.1 per cent iron, and the balance zinc. It has a tensile strength of 30 to 35 tons per square inch, an elongation of 24 to 30 per cent, and a specific gravity of 8.3. It is a strong alloy, used in motor cars and naval work, being particularly suitable for valves, pump-rods, keys, heavy bolts, etc.

Some of the bronzes adapted to the hot-pressing process are nickel bronze and aluminum bronze. Nickel bronze gives a high polish with a silver tone and is especially suitable for plated work. It machines fairly well, has considerable strength and toughness, and also possesses anti-corrosion properties. Aluminum bronze gives a brilliant golden yellow color, has a high tensile strength, but is inclined to be hard. It is not so susceptible to the effects of heat, and at 575 degrees F. has a high tensile strength and greater hardness than brass at normal temperatures. It resists the corrosion of sea water and has a remarkable resistance to stress and fatigue. It is especially suitable for valve guides and seats for internal combustion engines.

High-conductivity copper (99.9 per cent pure) can also be hot-pressed. This metal toughens considerably when hot-pressed. Silicon copper is also used for hot-pressing. It has properties similar to aluminum bronze, and is suitable for the same applications.

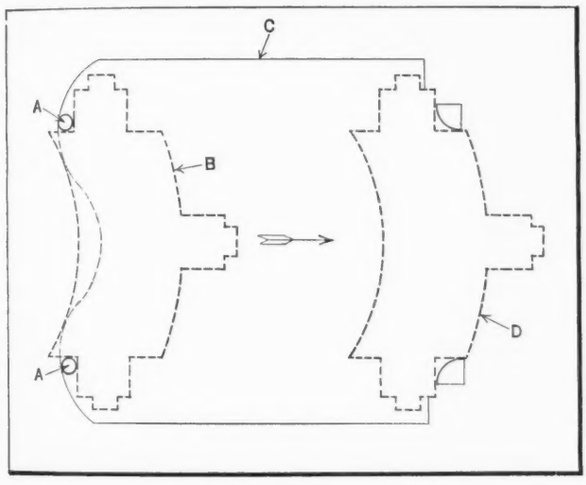
Aluminum and aluminum-silicon alloys were previously sand- or die-cast, but now hot-pressing is possible for these materials. Parts made from them have non-corrosive properties but a low melting point. The specific gravity is only 2.7.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Safety Feed for Forming Dies

An ever-present problem in the punch press department is to make the work safe for the fingers and hands of the operators. Various types of feed mechanisms and gravity chutes have been devised for this purpose. One arrangement used in connection with a gravity feed is shown in the accompanying illustration. With this device, the irregular-shaped blank *B* is laid on the inclined chute *C* and pulled back against the two pins *A* with a sort of wiping motion which tends to keep the fingers of the operator out from under the punch. When the blanks are located against the pins and released, they slide down the inclined chute into the proper position in the die nest at *D*.



Plan View of Inclined Slide Used for Feeding Pieces to Punch Press

S. B.

Using Wheels as Jigs for Cutting Circles with Acetylene Torch

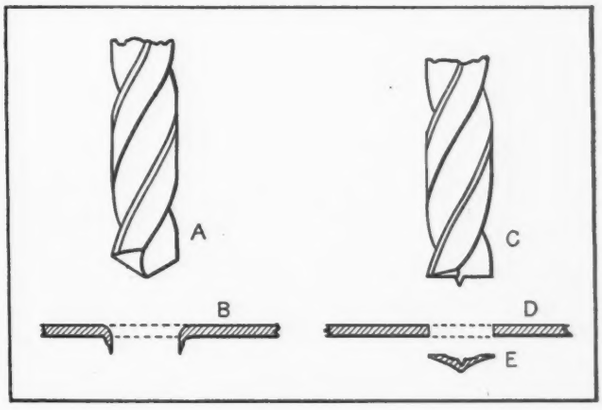
A set-up for cutting out circles or parts of circles in metal with an acetylene torch can be easily constructed from an old pulley or an old automobile or wagon wheel. The wheel is mounted on a vertical spindle suspended from an overhanging frame and the acetylene cutting torch is attached to the wheel. The distance between the point where the torch is mounted and the center of rotation governs the size of the circle cut. By mounting the torch upon a holder which has a sliding adjustment in a radial direction, it is a simple matter to adjust the device for cutting circles of any size within its capacity. The wheel is turned around slowly by hand, the work being watched closely in order to gage the cutting speed properly.

Peoria, Ill. JOHN E. HYLER

Sharpening Drill to Cut Clean-Edged Holes in Sheet Metal

The drill-sharpening kink described here has been found very useful when thin sheet metal is to be drilled. Considerable pressure is required to feed a drill through the work when it is sharpened in the usual manner, as shown at *A* in the illustration. When a drill sharpened in this way is used for thin material, the point will be pushed through the metal, leaving ragged edges around the hole, as shown by the cross-section view at *B*.

By grinding the drill as shown at *C*, however, a clean-edged hole, as indicated at *D*, will be obtained.



Drill A Ground in Usual Way Leaves Burr on Thin Sheet Brass, as Shown at B, whereas Specially Sharpened Drill C Cuts Clean-edged Hole, as Shown at D

A much lighter feeding pressure is required in this case. A cross-section of the small metal disk cut from the lower side of the piece of sheet brass *D* by drill *C* is shown at *E*. The small point at the end of the drill *C* is necessary to keep the drill centered on the work. Holes drilled in half-hard rubber will be nearer the size or diameter of the drill if the drill is ground as shown at *C*. A drill ground in this manner also gives good results in drilling wood.

Middletown, Conn. HARRY JOHNSON

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

S. A. A.—Can any of the readers of MACHINERY give me information regarding the best method of removing the burr or roughness on one side of a gear after the hobbing operation has been performed? Have sand-blasting, scratch-brushing, or tumbling been found to be satisfactory methods of accomplishing this? The experience of others along these lines would be of value.

Answered by George T. Dixon
Riverside, Ontario, Canada

In our shop, we use a good many hobbing machines, loading the gears on arbors. We have no difficulty with the burr on the last gear, because we have a tool arranged to remove the burrs automatically as the work revolves. This tool is clamped to a bracket on the over-arm of the machine which reaches down just in back of the last gear on the arbor. The tool is made from 1/2-inch square cutter stock and is ground so that the cutting edge is parallel to the back face of the last gear. This cutter can be easily adjusted to shear off the burrs as the work revolves.

Validity of Printed Statements on Bill-Heads

A. B. M.—On our bill-heads we print, "Boilers and machinery bought from us remain in our name until paid for in full." This line appears under our name and above the actual written itemized bill. Is this printed statement legally binding on the purchaser?

Answered by Leo T. Parker, Attorney at Law,
Cincinnati, Ohio

Various Courts have held that a printed statement on a contract, bill-head, bill of lading, or letter-head is not effective, particularly if the printed statement is contradictory to the statements contained in the body of the contract or letter. Moreover, it has been held that a stipulation printed in small inconspicuous type is not effective unless referred to in the body of the letter or contract. This rule of the law is based upon the following established principle of law:

"Where a contract contains two repugnant provisions, the one printed and the other written, it is well settled that the latter must control the interpretation of the instrument, as it is presumed to express the latest intention of the parties. The principle prevails that contracts should be so construed as to give effect to every word and expression contained therein."

For this reason, where a letter or other contract is written on a sheet containing a notice printed in small type in an obscure location, it is practically certain that the Courts will hold such a notification void and of no effect, unless it is proved that the purchaser's attention was directed to the notice.

In a late United States Court case (223 Fed. 704), the Court said: "It scarcely needs the citation of authority to support the well established rule that the printed portions of a contract, when repugnant, must be subordinated to those that are written, and that the latter are presumed, from the circumstances of their special and deliberate insertion by the parties, to embrace the real intent and meaning."

Occasionally, a contract will contain parts printed, typewritten, and pen-written. Recently a Court held that pen-written portions are first in importance; typewritten portions are second; and printed portions are last.

Therefore, your above mentioned notification may be valid, if the purchaser's attention was directed to it before the contract of sale was completed, and *no* other typewritten or written portion of the contract contradicts the notification. The fact that you notify a purchaser of some condition not made a part of the contract of sale, and of which the purchaser had no knowledge, does not obligate the purchaser.

Cyanide Hardening

E. G. B.—The following questions pertaining to cyanide hardening are submitted to MACHINERY'S readers: (1) In hardening by the cyanide process, is it preferable to use straight cyanide of potassium, or are there other materials which, when added, would improve the depth of penetration and the degree of hardness? If so, in what proportions should these materials be used? (2) What is the method recommended for handling small articles, say, 1/4-inch set-screws, so that when they are withdrawn from the heating liquid and thrown in the water there will be no "explosion"? (3) What is the best material for the cyanide pots? Is heat-resisting steel recommended?

* * *

Of the total number of automobiles and trucks in operation at the end of last year, 14,000,000 were more than four and one-half years old, while 7,500,000 were more than seven and one-half years old.

Designing Enclosed Gear Drives for Successful Lubrication*

By AUSTIN KUHNS, Mechanical Engineer
Farrel-Birmingham Co., Inc., Buffalo, N. Y.

THE problems which arise in the lubrication of enclosed gear drives must first be defined. These include the selection of the most suitable lubricating compound and the arrangements for its effective application. The lubricant must maintain a film which has all of the necessary lubricating qualities between the working or contacting surfaces, and must dissipate the generated heat and keep the frictional areas clean.

The suitability of the lubricating compound, therefore, depends upon the unit load to be carried by the gear teeth. This, in turn, depends upon the type of gear teeth, the precision of their manufacture, and the materials used. The load-carrying capacity of straight-tooth spur gears has been the subject of careful research (see the publication by the American Society of Mechanical Engineers, "Dynamic Loads on Gear Teeth"), but no similar comprehensive study of the load-carrying capacity of helical gears, either single or double, has yet been made.

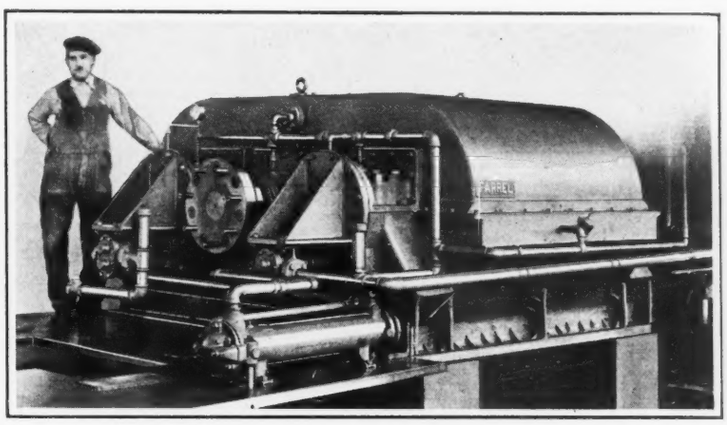


Fig. 1. Farrel-Birmingham 600 H.P. Enclosed Gear Drive for a Dredge, Designed for Operating Completely Immersed in Water

Before an intelligent selection of the lubricating compound can be made, the designing engineer must consider the following factors:

The power rating, including the expected peak loads; the size of the housing and its oil capacity; the type of bearings, their size, and their rubbing speeds and unit pressures; the method of applying the lubricating compound—whether by splash or positive circulation; and any special feature necessary to satisfy the requirements of the installation.

This requires that the designer study carefully all available information. He must ascertain the type of driving unit, its speeds and its power characteristics, together with the expected peak loads and other unusual conditions of service. The power rating of the gear unit is expressed in terms of horsepower, and usually agrees with the rating of the driving unit.

The size of the housing is determined by the center distance between the shafts and the face width of the gears. Frequently, available floor space or some special requirement influences the center distance; otherwise, the drive is selected from standard sizes. The oil capacity is calculated from the dimensions of the housing, and, if necessary, is increased through change in the housing contour or the addition of a sump tank.

In the selection of the sizes and proportions of the sleeve type of bearings, the shaft diameters are first calculated from certain conservative, well established formulas, and then the proportions of the bearings are determined by using past experience as a guide. The unit bearing pressures and the rubbing speeds are carefully considered and frequently the dimensions are modified accordingly; also, the type of bearing metal and the method of pouring it are fully considered. The high load-carrying capacity of anti-friction bearings usually makes it only necessary to select large enough bearings to accommodate the shaft.

Type of Lubricating System Used Influences the Selection of Lubricant

The designing engineer must decide whether the lubricating compound shall be applied by splash, by a positive circulating system, or a combination of the two. Also, he must decide whether the gears and bearings shall be lubricated by separate compounds or by a single lubricant.

With the splash system, the quantity of lubricant applied to the rubbing surfaces is usually less and a heavier bodied compound is advisable; also, one which will not fly off the gear teeth easily and one which will not foam readily.

*Abstract of a paper read before the Lubrication Meeting of the American Society of Mechanical Engineers at State College, Pa.

To lubricate both the gears and the bearings with a single compound introduces a compromise in the characteristics of the lubricant. It must not gum and obstruct the passages which feed the bearings and yet must have sufficient adhesiveness to cling to the gear teeth until they come into mesh, and have sufficient body to prevent metal to metal contact. The new "extreme pressure" (E.P.) lubricants appear to have real value under these conditions.

Having all of this information before him, the designing engineer, preferably in consultation with the lubricating engineer, is in a position to make an intelligent selection of the lubricating compound.

It is customary for the gear designer to limit his specifications to the approximate viscosity zone, the quality of the lubricating compound which he recommends, and the amount required. An accepted and recognized scale of comparative specifications for industrial lubricants like the S.A.E. numbers for automotive lubricants would permit him to enlarge the scope of his recommendations, with perfect neutrality towards the individual manufacturers of lubricants. This would enable him to take advantage of the wide difference between lubricants in their effect on wear, mechanical efficiency, noise, vibration, maintenance, and work life of the unit, and to assign different horsepower ratings for the same size of gear drive, depending upon the specific lubricant to be used.

Splash System of Lubrication

There are two methods for supplying and distributing lubricating compounds in gear drives—the splash and the pressure systems. The splash system depends on the action of the teeth in the gear as they pass through a reservoir of lubricant in the base of the housing. The lubricant is splashed about in a finely divided state, reaching every part of the housing.

To avoid excessive churning and foaming, the gear should dip only a comparatively small amount into the reservoir of lubricating compound. Just how deep depends on the tooth velocity, the pitch, the design of the gear, and the type of lubricant. Usually the teeth dip in a little more than their own depth.

Experience shows that it is necessary that there be a large amount of lubricating compound in the reservoir. This requires a large trough, which should be of almost rectangular section

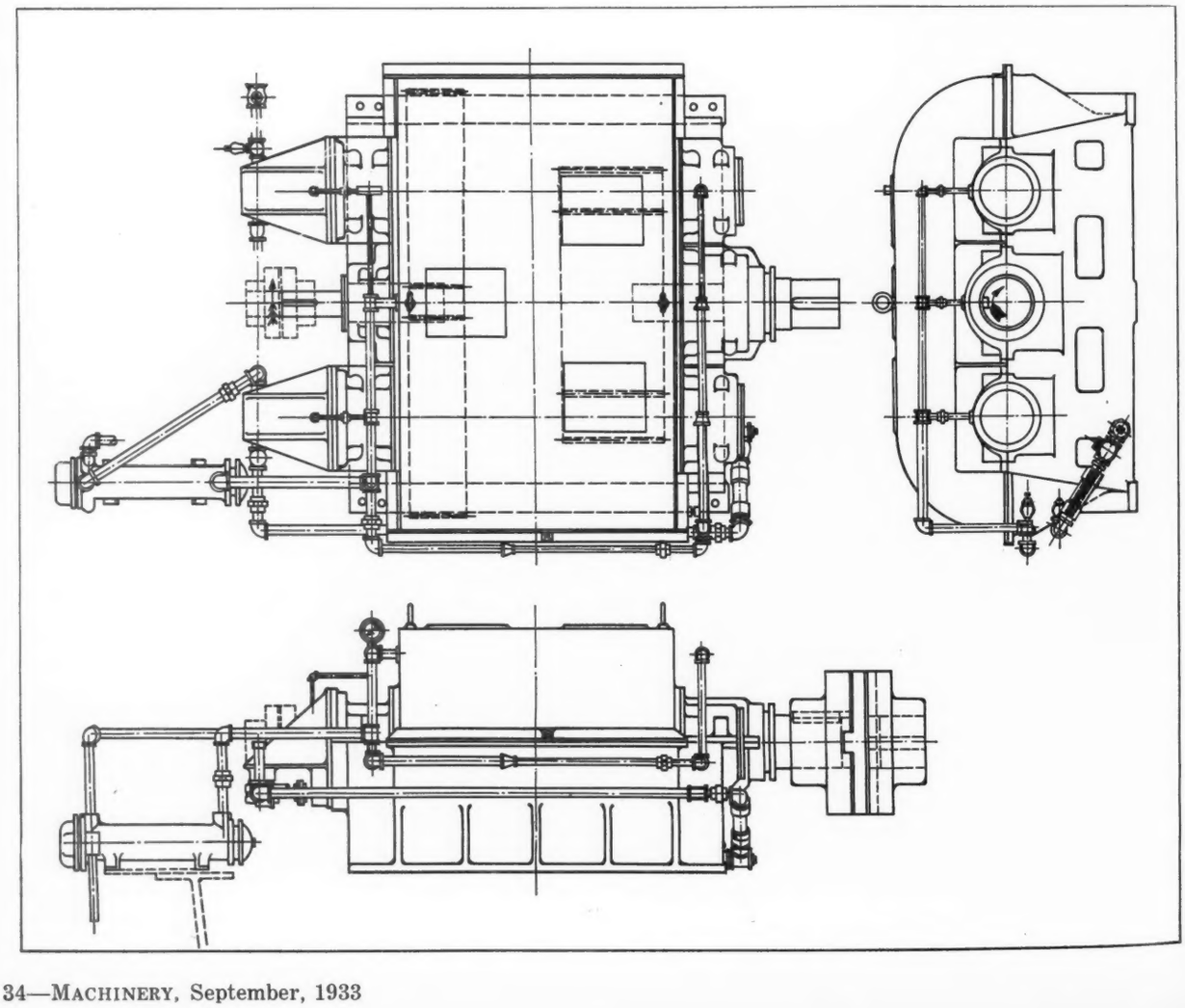


Fig. 2. General Arrangement of the Piping for the Lubrication System of the Dredge Gear Drive Shown in Fig. 1

and at no point close to the rotating gear teeth. Special gages are available to show the depth of lubricant.

Where the splash from the gear teeth is to lubricate the bearings, many ingenious ideas have been introduced. Often the lubricant which is splashed on the inside of the cover is collected in troughs which are cast as a part of the housing or cover, from which it flows to the bearings through passages or ducts. The return to the reservoir is through draining canals. Suitable seals are provided to prevent leakage along the shafts. Sometimes baffle plates and drip fins are used to further direct the lubricating compound.

Where separate lubricants are used for the gears and bearings it is necessary to introduce arrangements in the design which will prevent their interchange. This subject has received a great amount of study and many ingenious ideas have been worked out. The arrangements vary all the way from a complete separation of the chambers to the use of packing glands. The separate bearings are lubricated by oil-rings or collars and are provided with individual oil level gages. It requires just as much ingenuity to house anti-friction bearings and seal them against the infiltration of gear lubricating compound as it does for the sleeve type of bearings.

The Pressure System of Lubrication

The positive circulating or pressure system supplies the lubricant under pump or gravity pressure, through feed pipes, directly to the point of tooth engagement and to the individual bearings. It is used where the tooth velocities and bearing speeds are so high that the lubricant churns and heats excessively from the action of the gear teeth if they are allowed to dip into it. Also, at very high speeds the lubricants are thrown off from the gear teeth by centrifugal force and must be applied to the point of tooth engagement through specially designed spray nozzles. Positive circulation is also used in slower speed gear sets because it eliminates the "human element," and in special designs which cannot be lubricated conveniently by splash. Either a single compound or separate lubricating compounds can be used.

Great ingenuity has been displayed in the design of these positive circulating systems. A pump is required, usually of the gear or rotary type, driven directly from the gear unit itself through gears or chains, or by a separate motor. It is customary as a safeguard to include "tell-tales" or relays in the electrical hook-up, to insure a warning or shut-down if the pressure in the feed pipes becomes too low.

Individual pipes should be used instead of cored passages in the castings. Seamless steel or copper tubing is commonly used; recently, malleable iron tubing has been introduced. Bends are better than elbow fittings and individual pipes better than header distribution. Large drain pipes are essential. The flow of the lubricating stream is restricted fully as much by backing up in a small drain pipe as by an obstruction in the feed pipe.

In the case of the bearings, it is not only necessary that the lubricating compound be supplied in abundant quantities but that provision be included to distribute this lubricant from the feeding ports and introduce it between the rubbing surfaces. This problem has been the subject of a great deal of study and research work. There are many combinations of grooves, chamfers, and other methods for the distribution of compound in sufficient quantity to provide for its pick-up by the rotating shaft.

General Considerations in Efficient Lubrication

It is essential that there be enough backlash between the gear teeth and enough clearance between the shafts and their bearings. The lubricating compound should circulate freely around the areas of pressure. It should absorb the heat of friction. In many installations, scraping of the bearings, filing of the gear teeth, and a general loosening up of the fits have improved the operation of the gear drive to an astonishing degree.

Impurities and moisture in the lubricant are generally removed by a complete change of the lubricating compound, accompanied by a washing of the gears, bearings, and housings. The intervals between these changes vary widely and are determined by the character of the service. Usually they are far too infrequent.

The discharge of impurities and moisture from the circulating stream is assisted by designing the contour of the housing and sump tanks to provide settling spaces. With the pressure system it is customary to include special equipment for filtering the lubricant and actually separating it from the acquired water.

Keeping the lubricating compound cool involves two factors. The first is to prevent an abnormal generation of frictional heat. The second is to provide for the dissipation of the unavoidable heat.

Gears are surprisingly efficient. Most elaborate tests have proved that industrial herringbone gears may have an efficiency under full load of 99.4 per cent. Bearings, however, can generate considerable friction, especially at high speeds. Low overall efficiencies, with few exceptions, are caused by excessive churning of the lubricant in the reservoir by the gear teeth.

The ordinary frictional heat is dissipated by radiation from the housing in the majority of installations. Large reservoirs of lubricant, spacious covers, and circulation of air around the bases and bottom pans lower the operating temperature. Where box sections are used, large openings should be inserted in the outer and cross walls. Also, the gear unit has a far more favorable operating condition when placed in an exposed location than when near a furnace or boiler.

The subject of vents in the covers has received much thought and is one over which there is some

difference of opinion. If the vent is used, it should be accompanied by an air intake to provide a positive circulation of air within the top cover itself. The disadvantage of the vent, however, lies in the opportunity it presents for the infiltration of dust.

Where the size of the gear drive is small compared with the power rating, separate coolers or cooling coils are needed. These are used with splash as well as with positive circulating systems, and when required are used to heat the lubricant in the winter months. The cooling coils are usually made of copper and are installed in a sump tank or in the bottom of the gear drive itself. Recently a cooler made from automobile radiator cores has been tried out with success on the lighter-bodied oils. The advantage lies in its compactness and cheapness, and in its effective heat transfer.

* * *

Welded Steel Diesel-Engine Crankcases

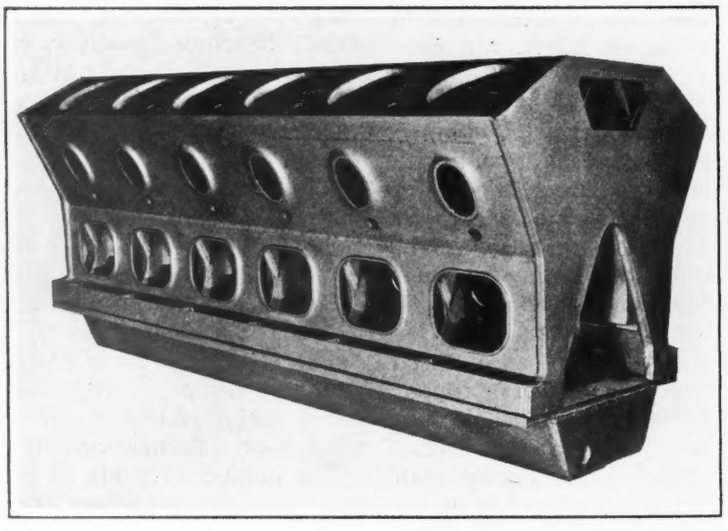
In a paper read before the Oil and Gas Power Division of the American Society of Mechanical Engineers at Atlantic City, August 23, Everett Chapman, vice-president in charge of engineering of Lukenweld, Inc., Coatesville, Pa., mentioned that one of the factors that have prevented the Diesel engine from assuming its rightful place as an important prime mover in the transportation field has been the great weight of Diesel-engine units. The usual weight of these engines is from 40 to 250 pounds per horsepower.

In his paper, Mr. Chapman showed that a great deal of this weight can be eliminated by using welded steel in the construction of these engines. The accompanying illustration shows a welded crankcase for a Diesel engine, mounted on the oil-pan, which is also welded and which forms the bottom tie for the complete crankcase. Made from high-strength alloy steel, this crankcase weighs only 2.6 pounds per horsepower. The entire engine weighs less than 10 pounds per horsepower, running on the test block. Welded radial-engine crankcases have been made weighing less than 1 pound per horsepower.

The tests to which these welded steel crankcases have been subjected offer conclusive proof that welded joints can be designed and constructed commercially to meet the requirements of the high stresses encountered in Diesel engines.

The power units of the Union Pacific System's new high-speed light-weight passenger train will have welded steel engine construction, as will also the Chicago, Burlington & Quincy's high-speed passenger train motive-power unit. The next step will doubtless be the employment of two or three of these units on a single base for main-line freight haulage, at a power economy never before approached.

Welded Steel Diesel-engine Crankcase and Oil-pan as Fabricated by Lukenweld, Inc. The Crankcase Weighs 2.6 Pounds per Horsepower



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Electrical Manufacturers' Code Now in Effect

The code for the electrical manufacturing industry, in accordance with the President's approval, went into effect August 15. Gerard Swope, president of the General Electric Co., after a meeting of the company executives at Bridgeport, Conn., August 14, said that the company had anticipated the acceptance date by one week, and that as far as hours and wages were concerned all changes were effective as of August 7. The hours have been decreased in accordance with the code to 36 hours a week in the shops and 40 hours a week in the offices. The 40-hour week in the offices has been in effect since April, 1931. All wages and salaries have been increased where necessary to reach the minimum, and equitable adjustments in other salaries have been made. The total amount of such increases is at the rate of $8,000,000 per year, affecting more than 42,000 employes, including almost 2000 additional employes immediately put to work. This is an indication of the practical effect of the new codes now put in operation.

* * *

The U. S. Civil Service Commission announces that applications for the positions of engineering draftsmen for work on ships will be received by the U. S. Civil Service Commission, Washington, D. C., not later than September 7. The positions are for filling vacancies in the service in Washington, D. C., and in other localities.

The Machinery and Allied Products Institute

The Aims and Purposes of the New Federation of Trade Associations that will Act as Sponsor for the Machinery Industries

THE organization of the Machinery and Allied Products Institute, with headquarters at 221 N. La Salle St., Chicago, Ill., has now been completed, and the following officers have been elected: President, John W. O'Leary, president of the Arthur J. O'Leary & Son Co.; vice-president, H. C. Beaver, president of the Worthington Pump & Machinery Corporation; secretary, Paul C. de Wolf, vice-president of the Brown & Sharpe Mfg. Co.; and treasurer, Robert H. Morse, president of the Fairbanks, Morse & Co.

The Machinery and Allied Products Institute is a federation of trade associations in the machinery field. It has been organized to coordinate the interests of manufacturers of mechanical equipment in their relations with the National Recovery Administration at Washington. The Institute is designed to handle the common problems of all machinery manufacturers in the preparation of codes of fair competition under the National Industrial Recovery Act, and has been formed in answer to the Administration's expressed preference for dealing with as large groups as possible in preparing industrial codes. The Institute was organized because there was no central coordinating agency for manufacturers of machinery and allied products, although in the aggregate they form one of the five largest industries of the country.

The Activities in which the Institute Expects to Engage

The purposes of the Institute may be divided into two classes: The immediate ones, for the present emergency; and the long-term aims, for future welfare of the industry.

Obviously, the first immediate aim is to include in the membership eligible groups of manufacturers of machinery and allied products that are not now affiliated with other groups, in order that the Institute may truly represent a majority of the firms manufacturing machinery and allied products. The Institute will also act as an exchange for information among its members in the preparation of a common code dealing with hours and wages. The preparation of agreements covering standards of practice will be left in the hands of individual trade associations; but endless confusion will be prevented if a single agency, instead of the representatives of many small groups, deals with the authorities in Washington on the hours-and-wage question.

The Institute will also be in a position to present a true condition of the machinery and allied products industry with respect to existing and past hours, wages, and volume of business, so that the industries and manufacturers represented may not be asked by the Government to accept conditions impossible of fulfillment.

Among the long-term aims of the Institute may be mentioned: (1) Establishment of the position of the machinery industry in the public mind on a level commensurate with its position as one of the first five groups of industries in size and importance; (2) collection, compilation, interpretation, and distribution of statistics looking toward operation, by the membership of the Institute, on a basis of informed planning; (3) coordination of the activities of the members, looking toward such stabilization as will result from uniform practices in cost accounting, employe relations, and the like; (4) the formation of a group truly representative of the industry, similar to the American Iron and Steel Institute and the National Electrical Manufacturers' Association.

Membership of the Institute

Individual companies are not eligible to membership; membership is open only to trade associations. All trade associations whose members are engaged in the manufacture of machinery, parts of machines, or allied products are eligible to membership, but associations of manufacturers of electrical equipment are not eligible, as they belong in the National Electrical Manufacturers' Association. Among the groups of manufacturers already represented by trade associations in the Institute may be mentioned the builders of machine tools, hydraulic machinery, oil and steam engines, air compressors, and rock crushers.

Only about one-third of the manufacturers in the machinery industries belong to strong, well managed trade associations. One-third are loosely organized in trade associations that meet only occasionally and that exercise few of the usual functions of such associations. The remaining third are entirely unorganized.

A trade association that joins the Institute does not lose its identity. It remains the same trade association as it was before. If it is strong, it will continue to function as usual. If it is weak, the Institute will stimulate and strengthen it. After the immediate task of the Institute in preparing codes has been completed, it can turn to stimulating such activities as engineering research, quality and dimensional standardization, uniform cost accounting, patent pooling, and improved merchandising methods.

In 1929, the machinery and allied products industries (excluding electrical machinery and railroad repair shops) employed 830,000 men and paid

them $1,400,000,000 in wages. By comparison, the textile industry employed 1,700,000 people and paid $1,700,000,000 in wages. The food industry employed 750,000 people and paid $900,000,000 in wages. The automobile industry employed 450,000 people and paid $900,000,000 in wages. The steam railroads employed 1,700,000 people and paid $2,940,000,000 in wages. The iron and steel industry employed 420,000 men and paid $730,000,000 in wages.

What Can the Institute Do for the Machinery Industry?

The new Institute is in a position to present a united front for scattered and diversified groups of manufacturers before the National Recovery Administration in connection with codes of fair competition. It can aid in making clear the importance of manufacturing efficiency in the recovery program.

There has, for example, been insistent recurrence of statements to the effect that the increase of efficiency in equipment and the use of machinery should be discouraged. It is obvious that such ideas merely propose to reduce the standard of living and counteract all the advance that has been made in recent years in the ability to supply human wants with less effort. The Institute can render a valuable service to its membership and to the public at large by the distribution of corrective information relative to this fallacy.

It is recognized, however, that there is a tremendous difference between the adoption by the industries of more efficient equipment in order to reduce costs of production and the installation of equipment in order to add to capacity. Industries and individual manufacturers should inform themselves (and here the Institute can be of valuable assistance) as to the need (or lack of need) for additional capacity, so that they can direct their actions accordingly. Efficiency is highly desirable in order to maintain the standard of living that this country has achieved, but additional manufacturing capacity, when not needed, is decidedly harmful.

The Institute cooperates with such organizations as the National Metal Trades Association, the American Standards Association, the American Society of Mechanical Engineers, and with the government departments.

The Institute is now developing a code. A representative committee has been in almost constant session, and has discussed with the Administration in Washington the broad principles and essential factors of a code for the entire machinery industry.

* * *

Luck means the hardships and privations which you have not hesitated to endure; the long nights you have devoted to work. Luck means the appointments you have never failed to keep; the trains you have never failed to catch.—*Tool Tips*

Recent Work in Kinematics

The art of machine design in the United States has largely been based upon empirical methods, and only to a very limited extent have machine designers made use of the different theories and methods of kinematics that have been almost entirely worked out by European engineers. The empirical, or cut-and-try method, is sometimes expensive, both in time and money, and progressive engineers have, of course, availed themselves of the theory of mechanisms that has been available in text-books.

During the last ten years, however, there have been some very definite developments in this science, of which little has been published in the United States. To bring these new methods before the engineering profession, the Polytechnic Institute of Brooklyn has decided to offer during the coming winter, a post-graduate course in "kinematics in the design of machines," starting September 28.

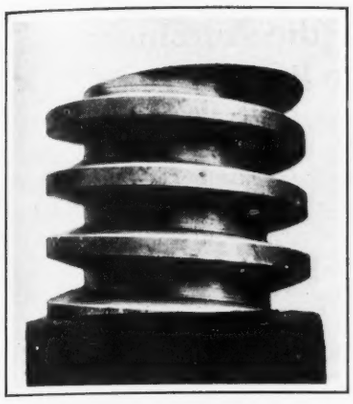
The course will comprise the latest developments of this science and its application to practical machine design. The lecturer will be R. de Jonge, who has been associated for a long time with the movement for developing this science and making it available to American engineers. Since the theory of kinematics forms the basis of all machine design and is thus a fundamental science, the same as mathematics and general mechanics, this course should prove of benefit to engineers who wish to be thoroughly informed on the latest developments in this branch of science. For further information, address the Brooklyn Polytechnic Institute, Brooklyn, N. Y.

* * *

National Metal Exposition in Detroit

Reservations made for the Fifteenth Annual National Metal Exposition, to be held under the auspices of the American Society for Steel Treating at Convention Hall, Detroit, Mich., during the week beginning October 2, are now far in excess of the total space occupied by the National Metal Show at Buffalo last year. By August 1, more than one hundred companies had reserved nearly 75 per cent of the available exhibition space, indicating that this will be the largest Metal Exposition since 1929.

In conjunction with the Metal Exposition, the American Society for Steel Treating will hold its annual convention. A National Metal Congress is planned, in which the American Welding Society, the American Institute of Mining and Metallurgical Engineers, and the Wire Association will participate. The program of the American Society for Steel Treating alone includes approximately thirty papers. All of the other associations, especially the American Welding Society, will also have very extensive programs, with a number of sessions, covering their respective fields comprehensively.



Cutting Large Worm Threads by Removing the Metal in One Piece

An Unusual Lathe Job that Effected a Great Saving over Ordinary Methods of Removing the Metal Between the Threads

A VERY ingenious method was used in one plant for cutting steel worms 14 inches in diameter, having a pitch of 3 inches. Instead of reducing all the metal between the threads to chips, grooving cuts were taken along each side of the thread and the metal was removed bodily in the form of a spring having a triangular cross-section, as shown in Fig. 1.

This operation was performed in a lathe equipped with a special device for automatically reversing the spindle. It was necessary to replace the gears operating the lead-screw by other gears in order to obtain the required ratio for the unusually large pitch to be cut. In addition to this, a special tool-holding device was used. This device, as shown in Fig. 2, consists chiefly of two tool-holders *A* which

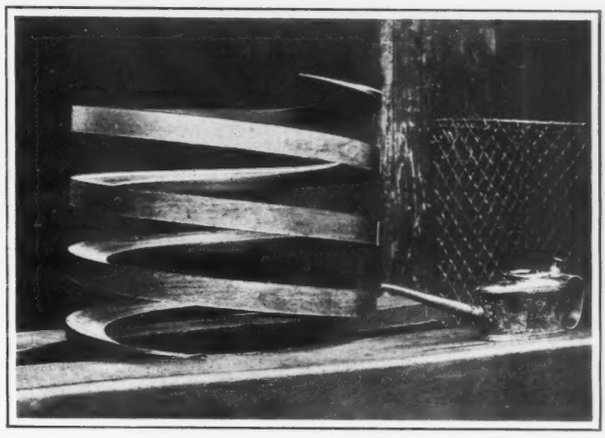
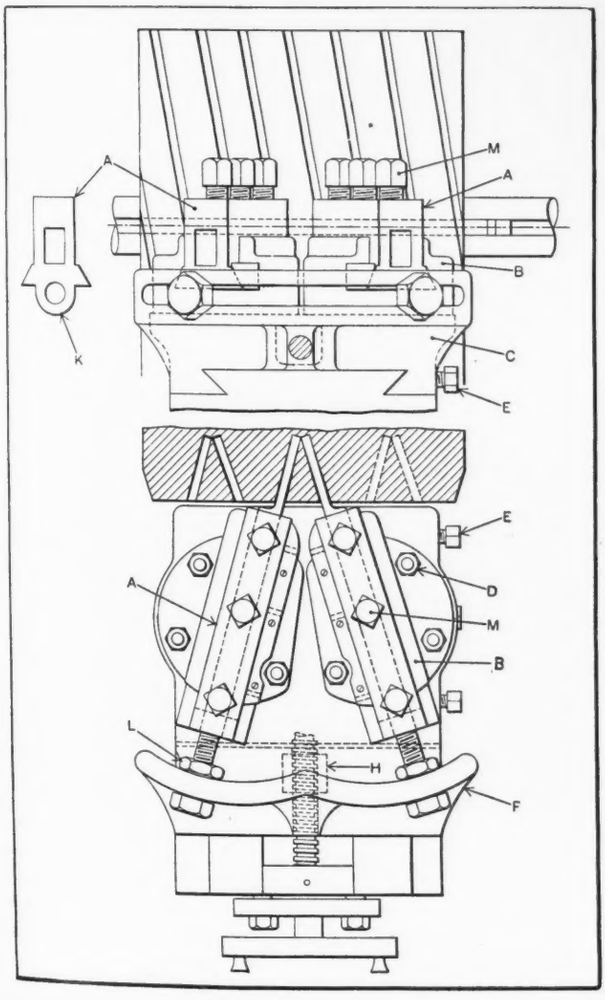


Fig. 1. Metal Removed in One Piece to Form the Thread on the Worm Shown in the Heading Illustration



slide in the guides *B*. The guides are bolted to the slide *C* which replaces the regular upper slide on the compound rest and is locked to the latter by set-screws *E*. The tool-slides can be swiveled, and the guides *B* are graduated so that the tool-slides can be adjusted to the required angle—in this case to 16 degrees, or one degree greater than the thread angle.

Member *F* is a sliding fit on the compound rest, and is provided with a nut *H* which meshes with the compound-rest feed-screw. Elongated slots in member *F* accommodate screws in the projecting lugs *K* on the tool-holders *A*. The check-nuts *L* are adjusted so that the screws will move along the elongated slots without binding.

In operation, the two grooving tools, which are 3/8 inch wide, are fed into the blank simultaneously

Fig. 2. Lathe Fixture for Grooving Both Sides of a Large Worm Thread, so that the Metal Can be Removed in One Piece

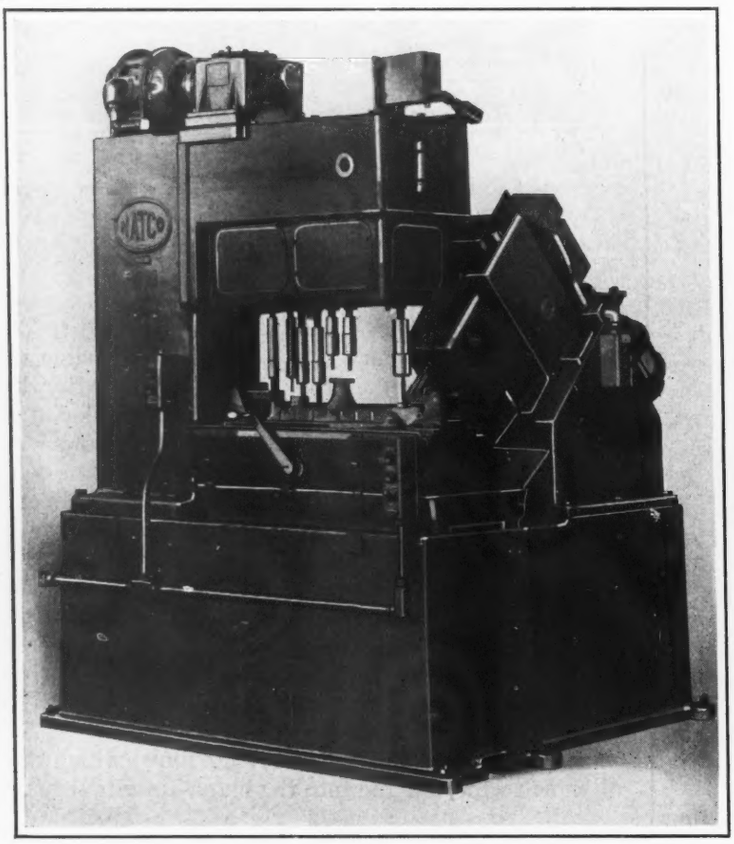
until they touch each other near the bottom of the thread. At this time, the spring-like scrap is severed from the blank, and when the tools are removed, can be unscrewed from the blank.

After the scrap has been removed, the grooving tools are replaced by side-facing tools and the toolholders are then set to the required thread angle of 15 degrees, after which the sides of the thread are finished. The root of the thread is next finished with a square-nosed tool, and the edges of the thread are then rounded off with a radius tool.

* * *

Tapping Seven Holes in Aluminum Covers at the Rate of 102 an Hour

Six vertical holes ranging in size from 5/16 to 3/4 inch and a 1/8-inch hole in an angular boss of an aluminum valve chamber cover are tapped simultaneously on the Natco two-way individual lead-screw tapper shown in the accompanying illustration at the rate of 102 pieces an hour. Each tapping head is driven by an individual reversing motor drive unit. One push-button station gives complete control of the machine. Individual push-button stations are provided for each unit to facilitate setting up the work. The machine is piped for delivering coolant to the taps.



Machine Built by the National Automatic Tool Co. for Tapping Seven Holes Simultaneously in an Aluminum Cover

Statistics of the Automobile Industry

The 1933 edition of *Facts and Figures of the Automobile Industry* has just been brought out by the National Automobile Chamber of Commerce, 366 Madison Ave., New York City. This book contains 96 pages of statistical information on the manufacture, sale, and use of motor vehicles. One of the interesting facts disclosed is that the decline in the number of vehicles in operation and in the quantity of gasoline consumed in 1932 was only 6 per cent, as compared with the previous year—much less of a curtailment than American families and business concerns found it necessary to make in the consumption of many other essential commodities. It should also be of encouragement to the motor industry to note that at the beginning of 1933 there were 6,400,000 cars and trucks in service that were over six and one-half years old.

Of the great volume of statistics available, the following figures may be of interest:

Passenger cars built in 1932.....1,186,209
Trucks built in 1932.....245,285
Wholesale value of cars and trucks...$793,045,300
Wholesale value of parts, accessories, and tires for replacement purposes $762,953,180
Capital investment in car and truck factories $1,489,900,000
Persons employed in automobile factories 229,841
Persons employed directly or indirectly in connection with the automobile industry, including salesmen, service station employes, etc. 3,900,000
Percentage of all steel produced used in motor industry 17
Percentage of alloy steel absorbed by motor industry 77.6
Percentage of strip steel absorbed by motor industry 53.2
Total number of vehicles registered at end of 1932.....24,136,879
Passenger cars registered....20,903,422
Trucks registered 3,233,457

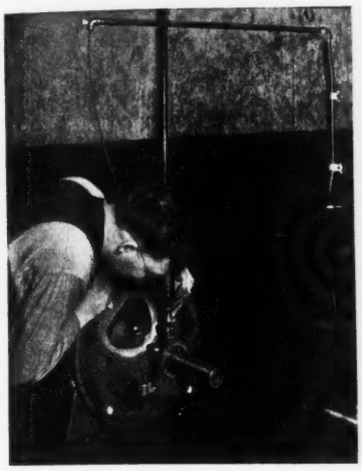
While New York maintained its position of having the greatest number of motor vehicles in operation—2,241,930 passenger cars and trucks—Washington was the only state that was able to report an increase in its registrations over the preceding year. States having the highest motor vehicle registrations after New York are: California, 1,971,616; Pennsylvania, 1,664,021; Ohio, 1,589,524; Illinois, 1,493,498.

* * *

In 1932, only 540 motor vehicles were imported into the United States, while our automobile manufacturers exported 181,055 cars.

A Small Light for Big Jobs

The small portable light shown in the illustration is extremely valuable for inspecting small parts of equipment that require to be repaired. It enables the repair man to inspect thoroughly the bearings, oil-rings and small parts of motors and other equipment without disassembling. At the East Pittsburgh Works of the Westinghouse Electric & Mfg. Co., this inexpensive miniature spot light was constructed from an ordinary fountain-pen type flashlight. It is attached to a flexible cord and arm in a convenient position over the bench; current is obtained from a small transformer mounted on the wall. As the ordinary extension light cannot be used for inspecting the interior parts of small apparatus, this "trouble light" has proved itself to be a time-saver and a valuable addition to the inspection bench. When not in use, the light can be placed in the receptacle at the end of the arm and swung aside until needed.



Inspecting a Motor Bearing with a Miniature Electric Lamp at the Westinghouse Plant

* * *

A Key to Industrial Recovery

A little booklet entitled "A Key to Industrial Recovery," written by Allen W. Rucker, in collaboration with N. W. Pickering, president of the Farrel-Birmingham Co., Inc., has been published by the latter company and is available by application to the Farrel-Birmingham Co., Inc., 8 Main St., Ansonia, Conn. The booklet, which can be read in a very few minutes, contains some important facts relating to the industrial recovery program and gives some valuable statistical information, clarifying some of the present problems.

An important point brought out in the booklet is the fact that it is advanced and improved types of machinery that have placed American labor on a level higher than that of workers in all other countries, and that the continued use of the most advanced types of machinery is necessary to preserve the high standard of living that has prevailed in this country, as well as the financial soundness of industry itself. The recent attacks on machinery are based on false premises and erroneous conclusions.

Trading-In Allowances

The Printing Equipment Association, which includes the builders of machinery, presses, and equipment for printing plants, in its proposed Code of Fair Competition which has been submitted to the Government, outlines a plan for trading-in allowances for used machinery which has several features of interest. Briefly, the plan is as follows:

Every manufacturer and dealer shall establish his own maximum allowances for machines and equipment of his own manufacture that will be accepted in trade as part of the purchase price of new machines and equipment. This schedule he files with the Printing Equipment Association office and will adhere to this schedule until at least ten days after he has filed a revised schedule. On request, every member is entitled to obtain a copy of these schedules of allowances; and no member, whether manufacturer or dealer, shall accept in trade any used machines or equipment at an allowance greater than the allowance so specified by the respective manufacturers or dealers for their own machines.

In this way no seller of equipment will be in a position to offer a greater allowance than the manufacturer who has built the machines to be traded-in, would himself be willing to allow.

* * *

Tool Engineers Aid Standardization

The standardization committee of the American Society of Tool Engineers, 8316 Woodward Ave., Detroit, Mich., have engaged in the work of collecting and compiling in workable form all data and established standards and similar information of general interest to the members of the Society. The object is to provide tool designers and tool engineers who are members of the Society with condensed information and engineering data on standard products and materials for ready reference. Engineering societies and manufacturers who wish to cooperate with the American Society of Tool Engineers are asked to send such data as might be of value to the secretary of the Society at the address given above.

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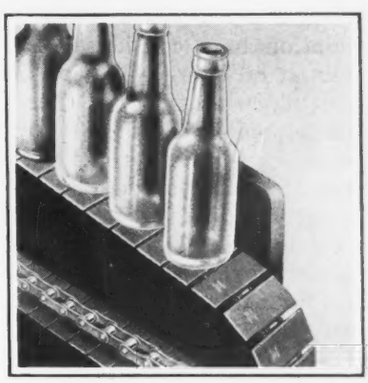
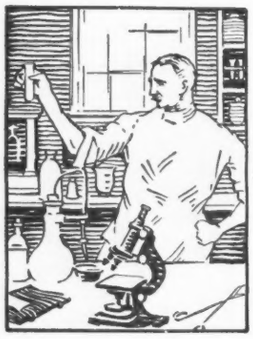


A New Type of Conveyor Chain Brought Out by the Whitney Mfg. Co., Finds the Bottling Business an Important Field



MATERIALS OF INDUSTRY

PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Liquid Rubber—A Coating that Protects Metal and Other Surfaces

A rubber product in paint form known as "Rubprotex 500 Series" has been developed by the Rubprotex Laboratories, 1059 E. 76th St., Chicago, Ill., for the complete protection of metal, concrete and other materials. This rubber product is not affected by acids, alkalies or petroleum oils of any class in any concentration, whether gas, liquid or fume, provided these agents are not themselves solvents of the rubber product.

Face coats of Rubprotex 500 Series are gray, white, or transparent, while primer coats are red. Before Rubprotex is applied to a metal surface, the surface must be thoroughly cleaned and dried, and be free from rust, grease and oil. The surface should be wire-brushed or sand-blasted.

Industrial Uses for Gallium

Only a few years ago, the encyclopedias said about the metal gallium that "only very small quantities of gallium have yet been obtained and the metal has no industrial importance." This statement is now challenged by the Vereinigte Chemische Fabriken zu Leopoldshall, Germany, where methods for obtaining gallium in reasonable quantities have been developed and uses found for the metal. Through the new methods, the price has been reduced from $200 to $4 per gram.

The metal is silver white, resists oxidation to a considerable extent, melts at 86 degrees F., and boils at about 3600 degrees F. The latter quality makes it suitable for thermometers for high temperatures—up to 1800 or 2000 degrees F. It is also expected to find important uses in the electrical field as a substitute for mercury, as well as in the radio-tube industry. Experiments have been made with this metal in dental work, where it has been tried out as a substitute for mercury in amalgams for filling teeth. The high reflecting powers of the metal may also find use in scientific optics. Thus the new metal may find many uses.

The Growth of Alloy Cast Irons

It is well known that the repeated heating and cooling of cast iron may make it "grow" to an appreciable degree. This is not a temporary increase in dimensions by expansion due to heat, but a permanent volume increase. The accompanying photograph from *Nickel Cast Iron News* illustrates this phenomenon. In the illustration, the four bars from left to right show, respectively, (1) a blank illustrating the original size and surface condition of all the test bars; (2) a bar of Ni-Resist cast iron; (3) a bar of nickel-chromium cast iron; and (4) a bar of ordinary gray iron. The last three bars have been subjected to identical conditions as regards heating and cooling.

The three bars, carefully finished to a length of 12 inches, were subjected to a series of thirty-five heating cycles involving a total of that many hours. Each cycle consisted of heating for forty-five minutes at a temperature of 1500 degrees F. in a semi-muffled furnace, adjusted to provide a slightly oxidizing atmosphere, and cooling in the air for a period of fifteen minutes. The Ni-Resist cast iron increased 1/32 inch in length, the nickel-chromium cast iron 7/32 inch, and the ordinary gray iron 1/2 inch. Hence, when growth due to repeated heating and cooling is objectionable, it is obvious that alloy cast irons can be used to advantage. Note also the surface of the Ni-Resist cast iron compared with the other bars.

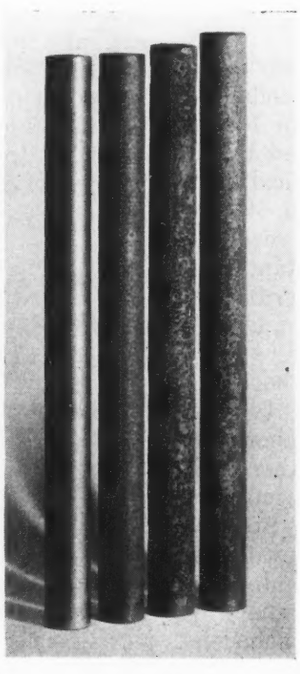


Illustration Showing Variation in Rate of Growth of Different Kinds of Cast Iron

A Help in Selecting Nickel Alloy Steels

If you wanted a 4-inch bar of nickel alloy steel with a yield point of 125,000 pounds per square inch, what steel analysis would you select? Or, suppose the bar was to be 2 inches in diameter and the yield point 175,000 pounds per square inch, what steel would you choose?

Answers to problems such as these are given instantly by a circular chart that can be obtained from the International Nickel Co., 67 Wall St., New York City. The user merely revolves a dial until an arrow points to the desired diameter of stock and to the desired yield point. A number designating the proper steel then appears in a slot in the dial, as well as the heat-treatment to be used for obtaining the different properties. The tensile strength, Brinell hardness reading, percentage of elongation, and percentage of reduction in area appear in other slots.

This chart is applicable to bars, shafts, and simple forgings. The chemical compositions of the different steels whose numbers are given, appear on the back of the chart, so that in that way quite complete information about the steel is given.

Unusual Machineability—The Feature of an Improved Screw Stock

Advances made in the manufacturing methods used by the Jones & Laughlin Steel Corporation, Pittsburgh, Pa., for producing Bessemer screw steel, have greatly improved the machineability of the steel. This improvement has been attained without any changes in the chemical analysis of the steel and without any sacrifice in its physical strength. It is claimed that the production rates of machines operating on the improved steel have shown increases ranging from 11 to 99 per cent, solely as the result of the improved machineability of the stock. This steel is made both in the S A E 1112 and J & L high-sulphur grades.

In machining the improved steel, the chips are short and brittle. Less energy is expended in the operation and so less heat is generated. Good cutting edges are maintained on the tools for a longer time than previously.

Effect of Molybdenum on Steel Castings

That molybdenum markedly increases the high-temperature strength of steel castings was a point emphasized in a paper presented at the annual convention of the American Foundrymen's Association in Chicago by Dr. H. W. Gillett and J. C. Gregg of the Battelle Memorial Institute, Columbus, Ohio. The indications are that simple annealed or normalized and drawn carbon-molybdenum cast steels have virtues for high-temperature service not yet fully appreciated.

The most outstanding properties conferred on steel by molybdenum are only noted ordinarily in the quenched and tempered condition. Molybdenum decreases the rate at which the steels must be cooled in order to become martensitic. Accordingly it tends, in proper amount and combination, to produce an air hardening steel or, in a lesser amount and with a smaller proportion of other alloys, a steel that can be hardened by a mild air quench.

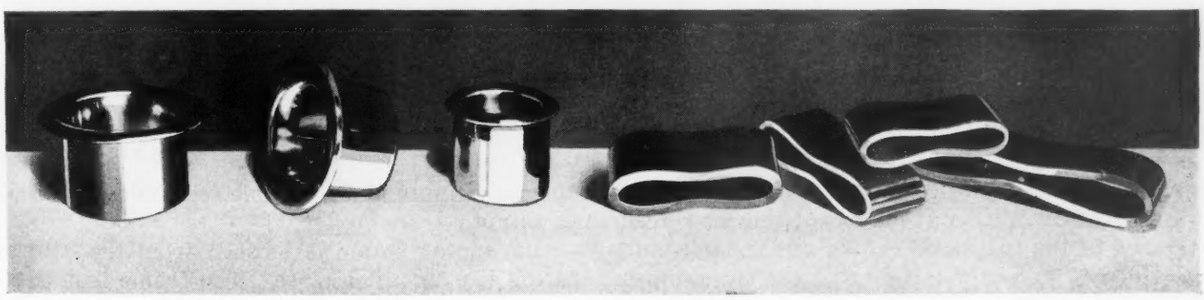


Illustration Indicating, to the Left, the Excellent Flanging Qualities of the Well-known 18-8 Corrosion-resisting Steel; and Showing, to the Right, Flattening Tests Performed on Tubing Made from this Steel—Courtesy National Tube Co.

A considerable content of molybdenum is required in a straight carbon-molybdenum steel to produce a high-strength product. However, many of the properties conferred by molybdenum can be obtained with small amounts of that element.

Nickel-Plating Continues to be Used Extensively

About 5 per cent of all the nickel that is produced is used in the plating of parts. It is interesting to note that the proportion has not changed materially since the development of chromium-plating, because every chromium-plated article is plated with nickel before the chromium is deposited. Incidentally, the thickness of the nickel coating is considerably greater than that of the chromium deposit.

Milling Fixtures that Accommodate Nine Sizes of Motor Frames

THE equipment employed to mill the feet of motor frames in the Canadian Westinghouse plant at Hamilton, Ontario, is shown in the accompanying illustrations. The standard spindle carrier usually mounted on the right-hand headstock of the Cincinnati Hydromatic milling machine, which is employed for this operation, has been replaced by two close-coupled spindle carriers. These carriers are designed with a minimum center-to-center distance of 7 inches, which takes care of the smallest motor frame milled. The maximum center-to-center distance is sufficient to accommodate the largest motor frame.

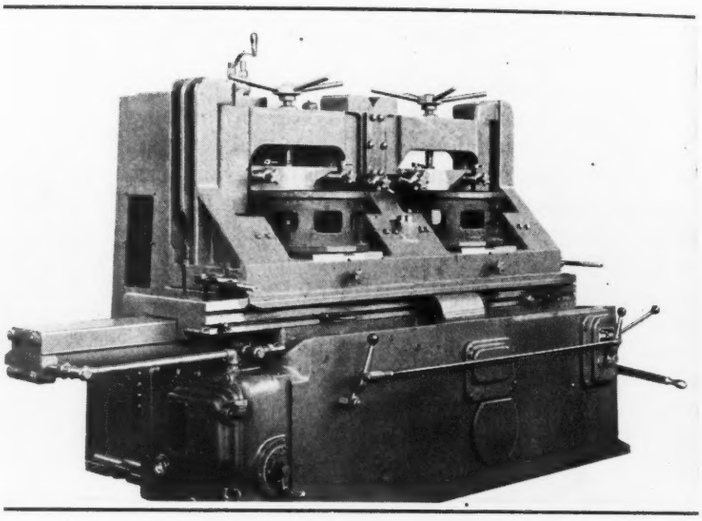


Fig. 1. Milling the Feet of Motor Frames with Equipment that Handles Nine Sizes

Two fixtures are mounted on the table, which has a two-way hydraulic reciprocation. The operator places a motor frame in one fixture while a frame in the other fixture is being milled. The cycle of operations is automatically controlled through dogs on the side of the table and is as follows: Rapid traverse of the table forward to the beginning of the cut, engagement of the feed, feed to the end of the cut, rapid return of the table, and stop. The movement of the table can be stopped in any position by means of two levers on the front of the bed, without affecting the sequence of the cycle.

The motor frames are made of cast iron and about 3/16 inch of stock is removed. The hourly production ranges from forty-two to seventy-five frames, with the spindle making sixty-two revolutions per minute and the table feed being 12 inches per minute.

Each motor frame is located from the bore by seating it over a flat plate. The frame is lined up from the rough back face of the two lower motor feet by means of stops operated by cams cut in a bar. This bar is manipulated by means of the lever at the corresponding end of the fixture. The motor frame is clamped on top by revolving the turnstile. The two ends of the clamp carry adjustable stops for backing up the two upper feet on the motor frame. The entire clamping unit is carried in a leaf which is hinged at one end and latched at the opposite end.

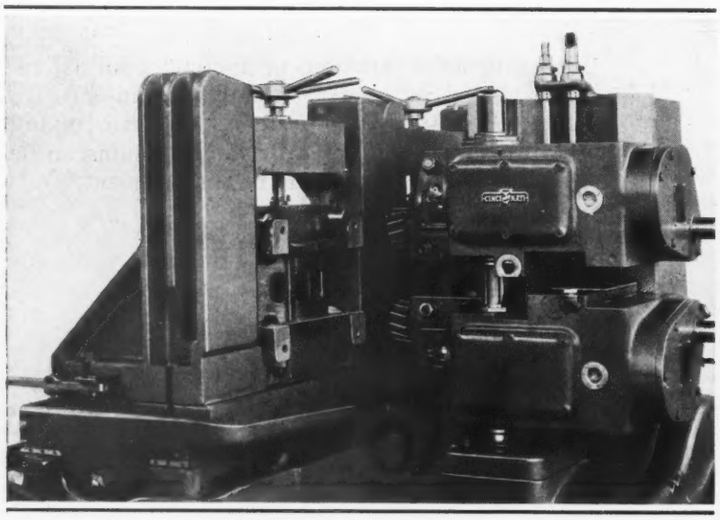


Fig. 2. The Cutter-spindle Carriers are Adjustable to Suit the Smallest and Largest Motor Frames

These fixtures were designed to handle nine different motor frames ranging from 6 1/4 to 11 inches in height under the clamping bar and from 9 3/4 to 15 inches in bore diameter. This range in sizes is accommodated by bolting additional clamping bars to those illustrated. The additional bars carry adjustable hand stops which are applied behind the upper motor frame feet. Interchangeable plates accommodate the different bore diameters. The two stops behind the lower motor frame feet were made sufficiently large so that they could be drilled and tapped over an area corresponding to the spread of the various motor frame feet. Stop-pins are changed from one set of holes to another to suit the different motor frames.

NEW TRADE LITERATURE

Any of these Publications can be Obtained by Writing to the Manufacturer or to MACHINERY. Send for Your Copy Today.

BEARING METALS. Federal Mogul Corporation, Detroit, Mich. Loose-leaf publication entitled "Bearing Metal Data," containing important information pertaining to a variety of bearing bronzes and alloys. The book is the result of a survey of bronzes by a group of technical men representing bearing manufacturers and of research carried on at the Battelle Memorial Institute under the auspices of the Copper and Brass Research Association. It will serve as a new basis for bearing calculations and specifications and should be especially useful to designers.

MOTORS. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet 20537, illustrating and describing Westinghouse Type G high-speed synchronous motors with thermoguard protection for constant-speed machinery. Leaflet 20580, descriptive of Type FH resistance split-phase motors for such applications as oil burners, fans and blowers, centrifugal pumps, grinders, and small woodworking tools. Leaflet 20584, describing a new complete line of splash- and drip-proof motors and control for machines.

LINK-BELT. Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill. Publication entitled "Serving Industry's Needs," covering the handling of materials and the positive transmission of power by Link-Belt equipment. By photographs and brief descriptions, the book shows dozens of different Link-Belt installations for a great number of industrial applications. It is specially published as a souvenir book of the Link-Belt exhibit at the Century of Progress Exposition in Chicago.

JIGS. Cleveland Universal Jig Co., 13404 St. Clair Ave., Cleveland, Ohio. Seventy-two page catalogue and reference book with helpful information for tool engineers and designers. The book shows five standard sizes of jigs, covering a range of work from 2 to 20 inches in over-all dimensions. It also shows drawings of twenty different standard top plates and special jig designs for work ranging from 2 inches to 14 feet in length.

FURNACE REFRACTORIES. McLeod & Henry Co., Troy, N. Y. Bulletin F-106, describing the company's new "Steel Mixture" oil brand firebrick for oil-fired furnaces, as well as Carbex silicon-carbide brick for boiler, stoker, and industrial furnace linings, high-temperature fire cements, furnace linings and arches, etc. Information on the selection and care of firebrick furnace linings is included.

HONING MACHINES. Barnes Drill Co., 814 Chestnut St., Rockford, Ill. Bulletin 121, entitled "The Honing Process for Superior Finish-Machining of Internal Cylindrical Surfaces." This is a twelve-page bulletin completely describing the honing process, giving a great deal of honing data, and showing the machines and hones used in precision honing.

PERCUSSION PRESSES. Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J. Catalogue illustrating and describing Zeh & Hahnemann patent percussion power presses; straight-side single crank presses; inclinable power presses; and power punching presses. Complete specifications are given for the various sizes and styles.

METALS. Cramp Brass & Iron Foundries Co., Paschall Station, Philadelphia, Pa. Bulletin containing data on "Elfur" electric furnace iron and "Ni-Resist," a corrosion- and heat-resistant alloy. Bulletin descriptive of the physical properties and applications of Cramp's "Superstrength" bronze.

HEAT-TREATING EQUIPMENT. Sentry Co., Taunton, Mass. Bulletin 1012-2, descriptive of the Sentry diamond block method of hardening high-speed steel, the object of which is to produce a neutral atmosphere, resulting in clean hardening, with no scale, decarburization, or reduction in size.

MEEHANITE. Farrel-Birmingham Co., Inc., Ansonia, Conn. Circular describing the properties of Meehanite, a specially processed iron of high strength, which, when heat-treated, attains a tensile strength of upward of 70,000 pounds per square inch.

AIR COMPRESSORS. Ingersoll-Rand Co., 11 Broadway, New York City. Circular illustrating and describing Class ES heavy-duty air or gas compressors, made in sizes from 10 to 125 horsepower and for pressures from 5 to 150 pounds.

STEEL. Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts., Chicago, Ill. Complete stock list, covering practically every kind of steel, including special grades of cold finished steels, alloy steels, and stainless steels, as well as brass, copper, and other non-ferrous metals.

FURNACES. W. S. Rockwell Co., 50 Church St., New York City. Bulletin 341, illustrating and describing the Rockwell razor-blade furnace, using electricity or gas, for continuous hardening, coloring, and tempering of razor-blade strip.

ELECTRIC TESTING EQUIPMENT. General Electric Co., Schenectady, N. Y. Circular GEA-1754, illustrating and describing portable testing equipment, including both high-voltage and high-current alternating-current testing equipment.

ELECTRIC CONTROL EQUIPMENT. Electric Controller & Mfg. Co., 2706 E. 79th St., Cleveland, Ohio. Bulletin descriptive of the new EC & M automatic weld timer for resistance welders, described in August MACHINERY, page 808.

ELECTRIC MOTORS. Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo. Bulletin 174, illustrating and describing vertical

motors of three different types, and explaining how horizontal-type motors can be mounted vertically.

LEVELS. Pacific Sales & Equipment Co., Ltd., 1438 Beachwood Drive, Los Angeles, Calif. Bulletin illustrating and describing the pendulum level for contracting, airplane, and machine shop work.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. Loose-leaf bulletin GEA-1771, illustrating and describing the Telechron motor-operated automatic timer for use on alternating-current circuits.

METAL DOORS. Durabilt Steel Locker Co., Aurora, Ill. Circular illustrating and describing the Durabilt overhead metal door—a steel door of hollow-metal type construction.

MOTORS. Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo. Bulletin 167, Part 5-A, illustrating and describing Type RB split-phase long-hour-duty motors.

BALL BEARINGS. New Departure Mfg. Co., Bristol, Conn. Loose-leaf circular 204 FE, descriptive of the application of ball bearings in hydraulic-feed drilling units.

POWER PRESSES. Allsteel Press Co., Inc., 12015 S. Peoria St., Chicago, Ill. Circular illustrating and describing the Verson Allsteel Junior press brake.

ZINC DIE-CASTINGS. New Jersey Zinc Co., 160 Front St., New York City. Folder illustrating typical parts made from zinc die-casting alloys.

TESTING SERVICES. Pittsburgh Testing Laboratory, Pittsburgh, Pa. Folder listing the services offered by the Laboratory.

* * *

Representatives of twenty metal-treating firms met in Chicago, August 18, and formed a national organization for companies engaged in commercial metal treating. The new organization is to be known as the Metal Treating Institute. The following officers were elected to serve until the next meeting: President, C. U. Scott, president of C. U. Scott & Son, Rock Island, Ill.; vice-president, T. E. Barker, president of Accurate Steel Treating Co., Chicago, Ill.; treasurer W. S. Bidle, president of W. S. Bidle Co., Cleveland, Ohio; secretary, W. H. Eisenman, 7016 Euclid Ave., Cleveland, Ohio. The next meeting will be held at Hotel Statler, Detroit, Mich., October 2.

The Cheerful Side

The machine tool industry recorded continued improvement in July, orders being 30 per cent greater than in June. Orders have increased steadily since March, the low point in the industry's business. The recovery is at a more rapid rate than after past depressions.

The July production of motor vehicles by the member firms of the National Automobile Chamber of Commerce, was more than three times the output in July, 1932. The figure for July last year was 58,771, and for July this year, 178,506. The output for the first seven months of this year exceeded the output for the entire twelve months last year.

WE DO OUR PART

MACHINERY is a member of the newly formed Periodical Publishers Institute, and, in addition to having signed the Blanket Code Certificate of compliance, is observing the Code submitted to the Government by that organization.

The Ohmer Register Co., Dayton, Ohio, reports that cash register sales for July exceeded the July sales of last year by 270 per cent, and showed an increase over June, 1933, of 30 per cent. During the early part of August, this rate of increase was being maintained. It is also a significant fact that the volume of business in foreign countries is keeping pace with the progress in domestic sales.

This is in keeping with the announcement made by the National Foreign Trade Council to the effect that American exports show gains in sixteen foreign countries, and that the increasing share of manufactured goods in our exports marks a renewal of active business abroad. "The tide of American foreign trade has turned," says the Council, "after a decline extending over forty-six successive months, ever since September 1929." The exports for June, 1933, exceeded the exports for June, 1932, by 8 per cent. There is also an improvement in import trade—a definite sign of better domestic business— the June imports being 11 per cent over the imports of the same month last year.

Cincinnati Machinery & Supply Co., Cincinnati, Ohio, dealer in new, used, and rebuilt machine tools, reports that the company recently shipped twelve machines of different types and sizes to Japan, including a wheel-turning lathe weighing 35,000 pounds. The entire order totaled $40,000.

Reports from Detroit early in August were to the effect that the Chevrolet Motor Co. had increased the pay of 40,000 wage-earners in its various plants by 15 per cent, in addition to a previous 5 per cent increase. Salaried employes earning less than $1800 a year were granted a 10 per cent increase. Other General Motors units have announced similar upward wage readjustments.

The Chrysler Corporation is reported to have made two 10 per cent advances to its employes, and the Packard and Reo plants have likewise put into effect increases in pay. The various wage increases in the automobile industry are estimated to affect about 200,000 workers.

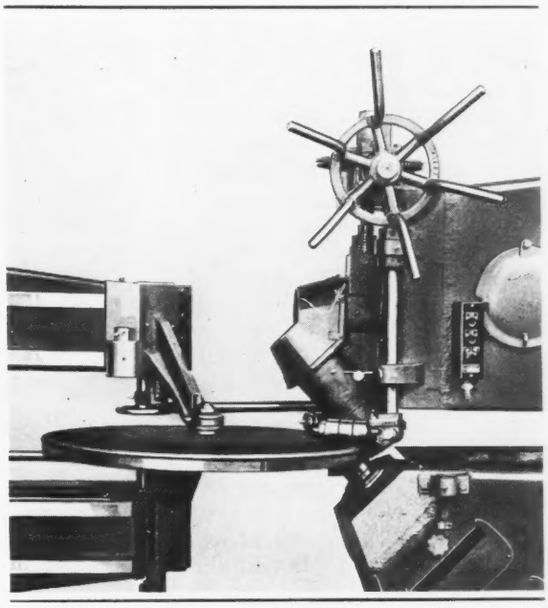
The New Departure Mfg. Co., Bristol, Conn., announced August 1 that all hourly wage rates and salaries of $1800 a year or less have been increased 10 per cent. This wage increase is in addition to the 5 per cent increase which was put into effect June 12. The increase affects 3750 employes now working in the Bristol and Meriden, Conn., plants of the New Departure Mfg. Co., of whom 2000 have been re-employed since April 1.

The Acheson Oildag Co., Port Huron, Mich., has announced an advance of 5 per cent in the wages and salaries of all employes of the company. This action is particularly interesting since it is stated that the compensation of those employed throughout the depression years, has never been reduced below the 1929 level.

The Carboloy Co., Inc., Detroit, Mich., manufacturer of cemented-carbide tools, has announced a 15 per cent wage increase to all employes working on an hourly basis.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts and Material-Handling Appliances Recently Placed on the Market



Quickwork Rotary Shear with Elliptical Flanging Attachment

Geared-head motors and welded steel construction were adopted for the No. 230 rotary shear now being introduced on the market by the Quickwork Co., St. Marys, Ohio, so that the machine could be readily supplied to meet individual requirements in regard to throat depth, speed range, diameter of cutters or rolls, and driving means. Both cutter shafts may be driven or only one may be used. The upper cutter shaft may be inclined or held horizontally. This freedom of construction to meet individual needs is possible largely because there is no dependence on patterns for the large parts.

Another important feature of the machine is that through the use of an attachment, elliptical heads can be cut and flanged. This attachment also enables the

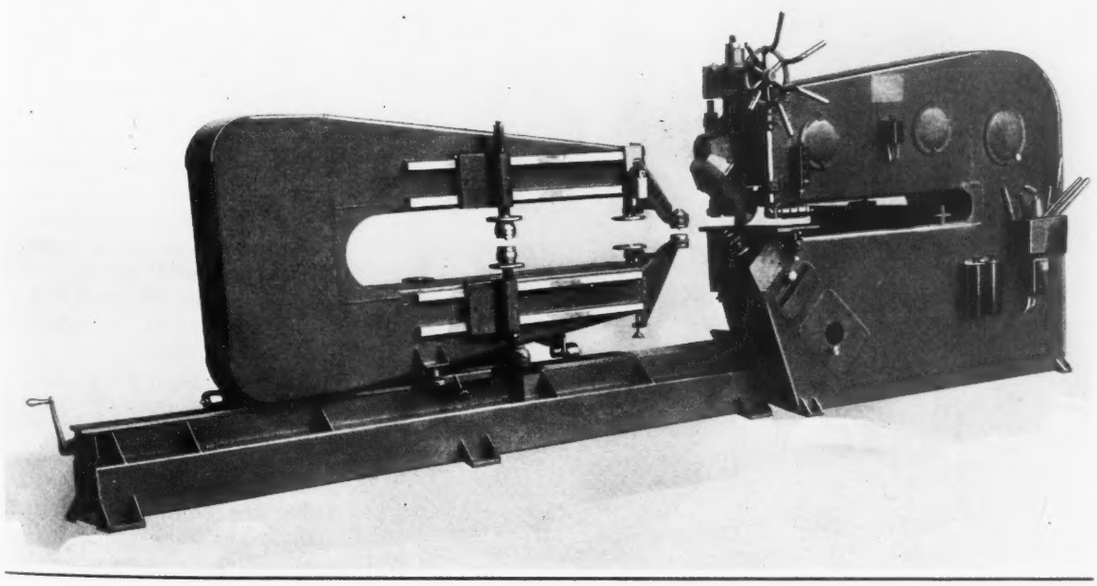


Fig. 1. Quickwork Rotary Shear of Welded Construction which is Capable of Cutting and Flanging Elliptical Heads

cutting and flanging of round heads from square blanks. Elliptical heads from 42 by 34 inches up to 84 by 54 inches can be produced, and round heads from 12 to 84 inches in diameter. The attachment also permits the slitting of steel sheets into strips from 3 to 44 inches wide.

The machine has capacity for shearing 5/16-inch mild steel and for flanging 1/4-inch mild steel or No. 10 gage corrosion-resisting steels of high tensile strength. Straight and irregular cuts can be made.

All shafts are mounted in anti-friction bearings and pressure lubrication is arranged for. The speed of the metal being cut may be at the rate of 12, 24, 36, or 72 feet a minute. In addition to the main frames, other major parts are of arc-welded steel-plate construction. Simplicity of design and speed of operation are emphasized by the builder.

Fig. 2. Typical Work Turned Out by the Rotary Shear Shown in Fig. 1

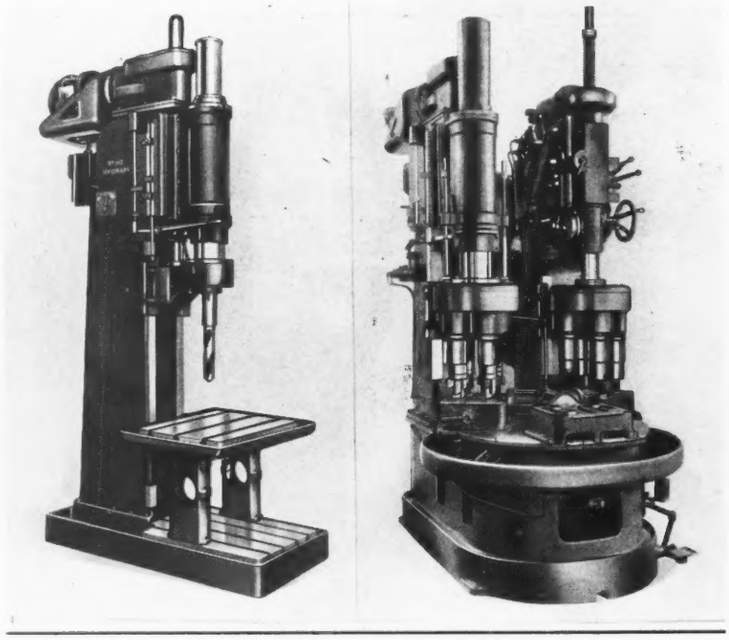
Barnes Drill Co.'s "Hydram Driller"

A hydraulic ram-feed drilling machine has recently been developed by the Barnes Drill Co., 814 Chestnut St., Rockford, Ill., in which the hydraulic pressure is applied directly over the center of the cutting tool. As may be seen at the left in the illustration, a hydraulic cylinder, large-diameter ram, and spindle comprise an individual unit that eliminates the need for a long saddle on the column ways. The short saddle takes the torque of the drive shaft.

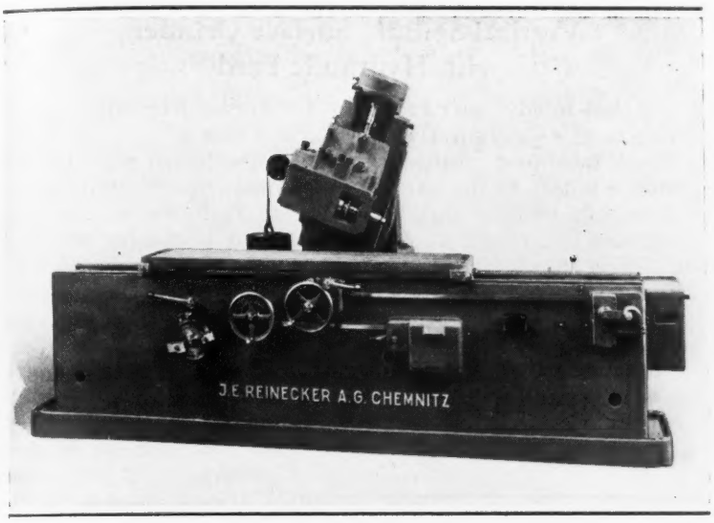
Power for driving the cutting tool is applied to the comparatively short spindle, with minimum torsional vibration, through a gear-case carried on the ram nose. The ram has been designed with a large diameter to insure rigidity. This hydraulic unit is unusually versatile as to spindle travel, interchangeability of multiple heads, and adaptability for vertical, horizontal, or angular applications. The hydraulic unit can also be made for cylinder boring and for independent use —for example, as a separate drilling head.

The ram feed is claimed to be tremorless in action, even when driving a 2-inch high-speed steel twist drill into solid mild steel. Hydraulic control of the machine permits any desired sequence of movements, as, for example, an automatic rapid approach, feed movement, hydraulic dwell for facing, and quick automatic return.

At the right in the illustration is shown a progressive type production machine with a "Hydram" head and a self-oiling, all-geared tapping head. Both these units are equipped with four-spindle auxiliary heads for boring, facing, and tapping pipe-union nuts and similar parts. The three-station table is indexed hydraulically.



(Left) Barnes Drilling Machine with Hydraulic Cylinder Directly above Spindle; (Right) Production Unit with "Hydram" and Tapping Heads



Reinecker Automatic Rack-cutting Machine

Straight- and Helical-Tooth Rack-Cutting Machine

Gear racks with straight or helical teeth or with one side of the teeth forming an acute angle to the base line can be cut in a Reinecker machine which is being placed on the American market by the George Scherr Co., 128 Lafayette St., New York City. For cutting helical teeth, either left or right hand, the cutter-head can be swiveled in the vertical plane up to 30 degrees in either direction. For cutting other types of teeth, it can be swiveled in the horizontal plane. The machine uses a disk type of cutter. It is fully automatic, the table indexing from tooth to tooth. The cutter-head is mounted, with a gear-box, on an upright at the rear of the bed.

Two flanged-type motors are used, there being one for driving the cutter through pick-off gears and a second for operating the feed, returning the cutter, and indexing the table. Indexing takes place after each return of the cutter. The table movement is automatically disengaged when the operation is completed, and the table is quickly returned to its starting position by shifting a handle.

The cutter-head feed can be changed within wide limits by means of pick-off gears. It is disengaged when indexing occurs. The machine control is centralized on the bed.

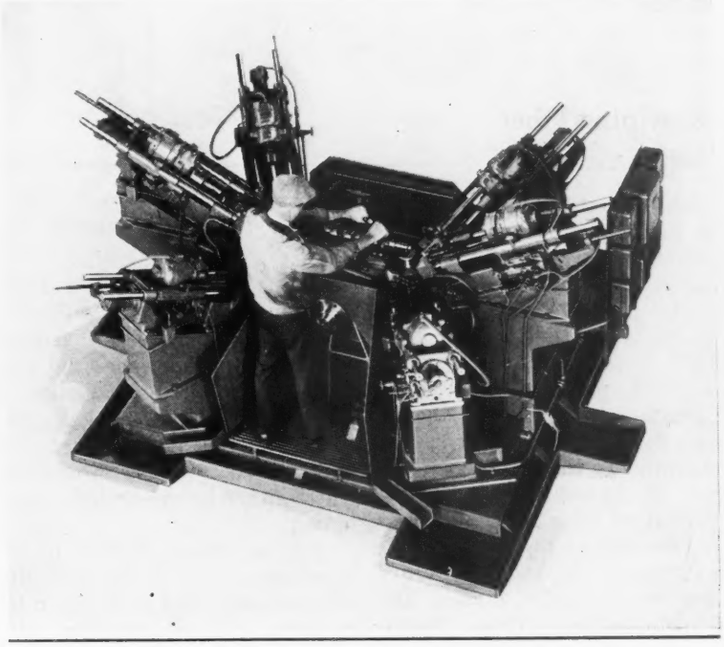
Gang cutters can be used to cut several teeth of fine pitch at one time. Roughing and finishing cutters mounted beside each other on the cutter-arbor are recommended by the manufacturer when the material is tough or the teeth of large pitch.

Tite Flex All-Metal Flexible Hose

The all-metal flexible hose and tubing which has been made in brass for years by the Tite Flex Metal Hose Co., 500 Frelinghuysen Ave., Newark, N. J., is now made of bronze with a tinned-bronze braid on the outside. This hose is intended for a large variety of industrial applications. It may be used on machines for carrying lubricant to working parts or for carrying coolant to the cutters and work. It may also be used for fuel lines on automobiles, trucks, airplanes, oil burners, etc.

Natco Six-Way Crankshaft Drilling Machine

A special drilling machine equipped with six hydraulically fed drill heads has been built by the National Automatic Tool Co., Richmond, Ind., for producing all the oil-holes in forged auto-



Natco Machine with Six Hydraulic Heads for Step Drilling the Oil-holes in Automobile Crankshafts

mobile crankshafts. All drill heads are completely controlled by one foot treadle, the machine being semi-automatic in operation.

Each drill unit is equipped with a single spindle that is arranged with a nose adjustment. A valve and trip mechanism permits automatic variation of the drilling depths, so that the deep holes in the crankshaft may be produced by the step drilling method. This feature permits the removal of chips and the cooling of drills during the operation. In addition to long drill life, a clean hole is obtained.

The fixture is of the four-position trunnion type. It is arranged to hold one crankshaft in each position, and is indexed to carry the crankshafts successively to the various drill heads. The base is of welded steel construction. It contains reservoirs for the hydraulic and coolant systems.

The production of this machine is approximately twenty-five crankshafts an hour. The machine weighs about 17,000 pounds.

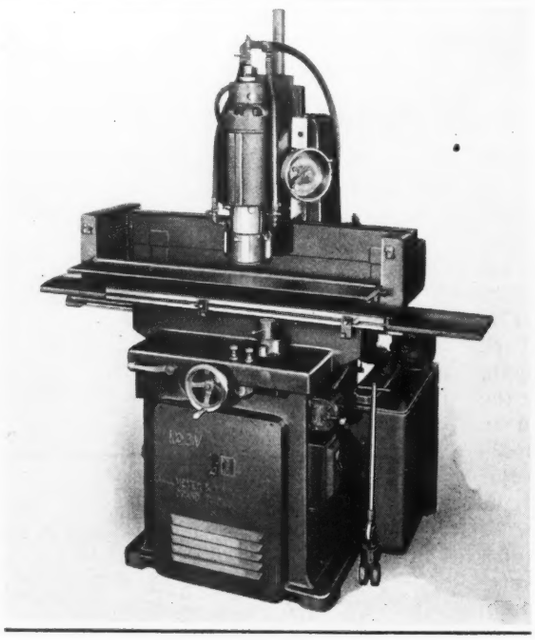
Rawlplug Fiber Screw Anchors

Anchors or retainers for holding screws in concrete, brick, tile, plaster, etc., have been brought out by the Rawlplug Co., Inc., 98 Lafayette St., New York City, in the form of a small tube built up of stiffened strands of tough jute fiber. The fiber is impregnated with a cement that is immune to the action of moisture or temperature changes.

The fiber tube fits snugly into the hole and as the screw is advanced into it, the fibers are compressed firmly against the wall of the hole. These "Rawlplugs" are made for all sizes of wood screws from No. 6 to 5/8-inch lag screws.

Vertical-Spindle Surface Grinder with Hydraulic Feed

A vertical-spindle surface grinding machine equipped with a hydraulic table feed constitutes the latest addition to the line of machines built by the Gallmeyer & Livingston Co., Grand Rapids, Mich. Table speeds from as low as 2 feet per minute and higher than 100 feet per minute are obtainable. Rapid table travel can be conveniently employed for roughing cuts and a slower travel for one or two light finishing cuts. This Grand Rapids No. 3-V machine is particularly suitable for grinding dies with guide pins in place, parallels, hardened washers, punches, small flat dies, etc., when rapid production is important. Gear blanks, disks, washers, and similar parts can be ground at fast production rates either before or after hardening.



Gallmeyer & Livingston Hydraulic-feed Surface Grinder of the Vertical-spindle Type

An important feature of the machine is that the grinding wheel is mounted directly on the spindle, thus eliminating belts. A 5-horsepower, 60-cycle motor is used. The hydraulic pump is also driven without belts by a 1 1/2-horsepower motor in the machine base.

A motor-driven rapid traverse mechanism is provided for the head to facilitate up and down movements in placing or removing work. Such movements are controlled by a double-throw switch which governs the operation of a reversing motor. There is a magnetic throw-out into the neutral position. An automatic down-feed variable from 0.0001 to 0.002 inch per stroke is a feature of the head. There is an automatic throw-out for the head feed.

Coolant is supplied to the work by a detachable portable system which provides maximum convenience in cleaning the tank. The latter is placed on the floor against the base of the machine. The tank cover carries a vertical ball-bearing motor, on the shaft of which a spider-type vane pump is mounted. There are no bearings under water and stuffing-boxes are not necessary. The tank has a vertical partition rising to within about 4 inches of the top to form the compartment in which the pump is located. The design of the tank is such that it is almost impossible for abrasive particles to reach the pump.

Oxweld Aluminum Flux

An all-purpose aluminum welding flux being placed on the market by the Linde Air Products Co., 30 E. 42nd St., New York City, is intended to replace two fluxes previously marketed. One of them was intended for welding pure aluminum and the other for welding aluminum alloys. The new flux welds both. It is packed in 1/4-pound jars.

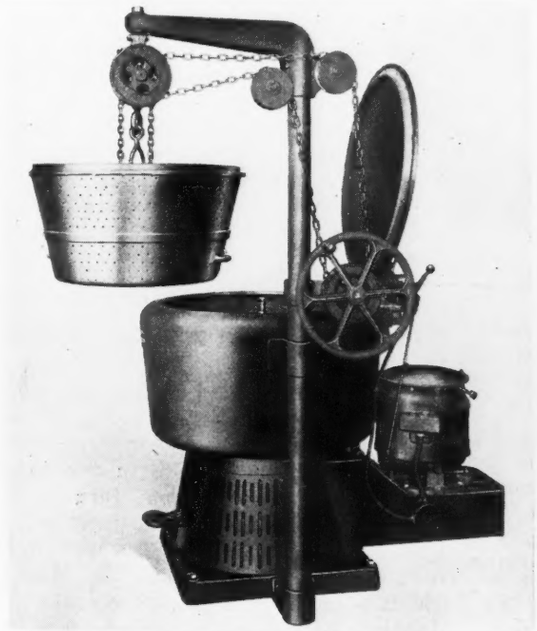
Tolhurst Solid-Curb Chip Wringer with V-Belt Drive

A solid-curb chip wringer with a V-belt drive is the latest development of the Tolhurst Machine Works, Inc., Troy, N. Y., in the line of equipment built by that concern for reclaiming cutting oil and adding to the value of metal chips. The external appearance of the machine differs from previous models because of added belt guards, foot guards, and a basket hoist. Important internal changes have also been made.

Two heavy-duty ball bearings capable of withstanding radial and thrust loads are provided for the spindle. These bearings are assembled in a dustproof housing. Lubricant is applied through a pressure fitting in the top housing cap which is always readily accessible. The spindle pulley is attached to the bottom of the spindle, instead of in the conventional location, with the result that endless belts can be passed between the bottom of the spindle and the floor when applying or removing them. This method of mounting the pulley also leaves the lubricant fitting and the belt tension adjustment clear of obstacles. Only one screw is used for adjusting the tension of the belts.

The basket is constructed of heavy-gage pressed steel, and it is fitted in the center with a casting to accommodate the lifting hook on the hoist. It is also provided with an easily removable cover that retains the chips when the machine is in operation.

A selective timer, which is supplied as optional equipment, cuts off the power supply at the end of a predetermined period and signals the operator with a light. This solid-curb chip wringer is available with baskets 20 and 26 inches in inside diameter. Center-slung models are made with baskets 40 and 48 inches in inside diameter.



Tolhurst Solid-curb Chip Wringer with Improved Features, Including a V-Belt Drive

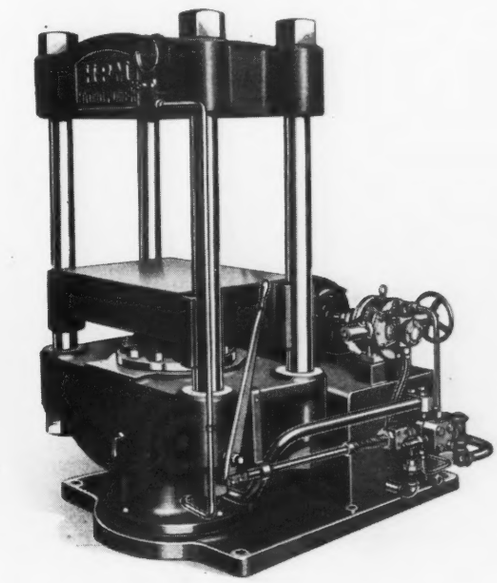


Fig. 1. H-P-M Platen Press with Hydro-Power Unit that Makes the Equipment Self-contained

Self-Contained Hydraulic Platen Presses

Two presses which are self-contained because the hydraulic operating pressure is generated by an H-P-M Hydro-Power unit (described on page 57 of this number of MACHINERY) have been developed by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The pressures exerted by these presses and the speeds of ram travel are subject to close automatic regulation.

Fig. 1 shows the basic model of this line of presses, the Hydro-Power unit being at the rear. It could be mounted on the side. This type of press is employed for many different kinds of forming operations and may be equipped with various types of fixtures to extend its utility.

Fig. 2 shows one arrangement of the basic press, an intermediate platen having been supplied to create two presses in one. This press is especially fitted for plastic molding service, being equipped with die bolsters and ejectors for semi-automatic or fixed multiple-

mobile crankshafts. All drill heads are completely controlled by one foot treadle, the machine being semi-automatic in operation.

Each drill unit is equipped with a single spindle that is arranged with a nose adjustment. A valve and trip mechanism permits automatic variation of the drilling depths, so that the deep holes in the crankshaft may be produced by the step drilling method. This feature permits the removal of chips and the cooling of drills during the operation. In addition to long drill life, a clean hole is obtained.

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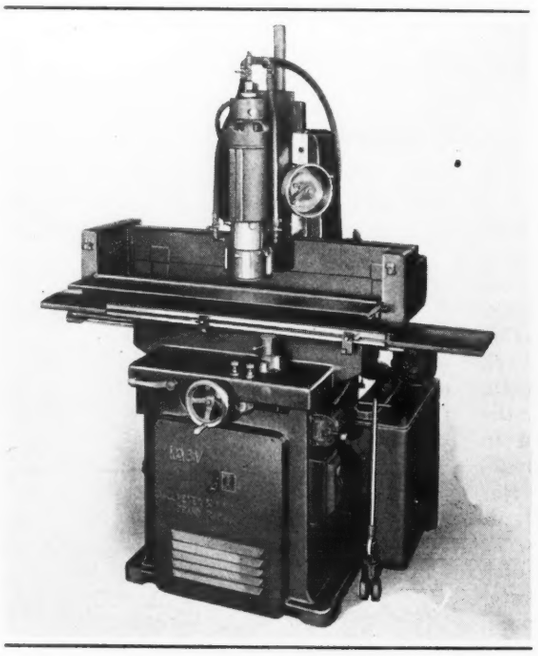

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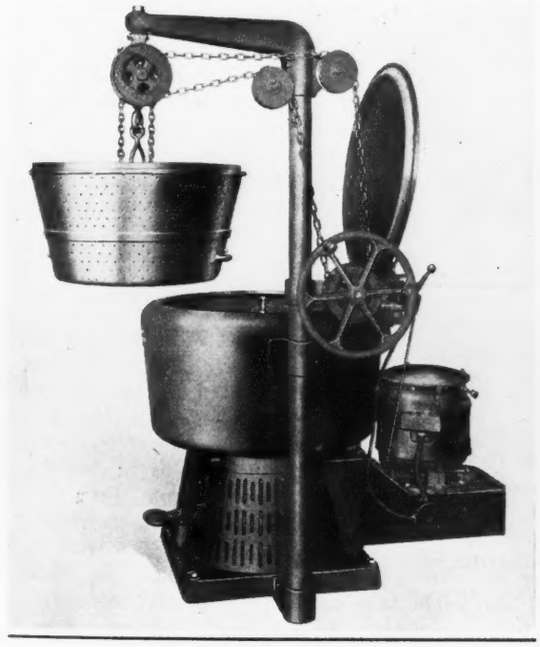
A solid-curb chip wringer with a V-belt drive is the latest development of the Tolhurst Machine Works, Inc., Troy, N. Y., in the line of equipment built by that concern for reclaiming cutting oil and adding to the value of metal chips. The external appearance of the machine differs from previous models because of added belt guards, foot guards, and a basket hoist. Important internal changes have also been made.

Two heavy-duty ball bearings capable of withstanding radial and thrust loads are provided for the spindle. These bearings are assembled in a dustproof housing. Lubricant is applied through a pressure fitting in the top housing cap which is always readily accessible. The spindle pulley is attached to the bottom of the spindle, instead of in the conventional location, with the result that endless belts can be passed between the bottom of the spindle and the floor when applying or removing them. This method of mounting the pulley also leaves the lubricant fitting and the belt tension adjustment clear of obstacles. Only one screw is used for adjusting the tension of the belts.

The basket is constructed of heavy-gage pressed steel, and it is fitted in the center with a casting to accommodate the lifting hook on the hoist. It is also provided with an easily removable cover that retains the chips when the machine is in operation.

A selective timer, which is supplied as optional equipment, cuts off the power supply at the end of a predetermined period and signals the operator with a light. This solid-curb chip wringer is available with baskets 20 and 26 inches in inside diameter. Center-slung models are made with baskets 40 and 48 inches in inside diameter.



Tolhurst Solid-curb Chip Wringer with Improved Features, Including a V-Belt Drive

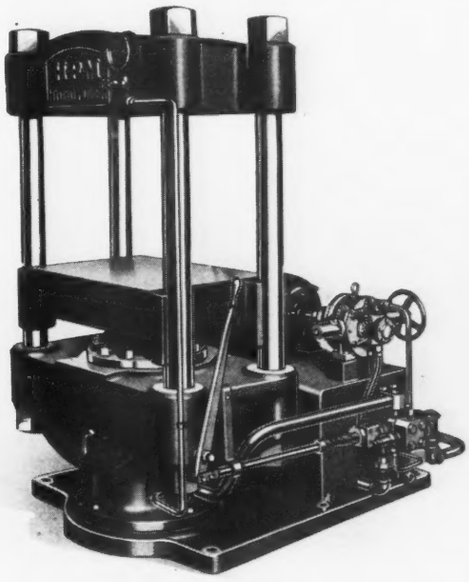


Fig. 1. H-P-M Platen Press with Hydro-Power Unit that Makes the Equipment Self-contained

Self-Contained Hydraulic Platen Presses

Two presses which are self-contained because the hydraulic operating pressure is generated by an H-P-M Hydro-Power unit (described on page 57 of this number of MACHINERY) have been developed by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The pressures exerted by these presses and the speeds of ram travel are subject to close automatic regulation.

Fig. 1 shows the basic model of this line of presses, the Hydro-Power unit being at the rear. It could be mounted on the side. This type of press is employed for many different kinds of forming operations and may be equipped with various types of fixtures to extend its utility.

Fig. 2 shows one arrangement of the basic press, an intermediate platen having been supplied to create two presses in one. This press is especially fitted for plastic molding service, being equipped with die bolsters and ejectors for semi-automatic or fixed multiple-

capacity molds. The presses of this line are available in standard capacities of from 25 to 500 tons.

Oxycop Oxygen and Gas Cutting Machine

Steel sheets of large area can be cut to any desired outline by means of a machine which operates on oxygen and low-pressure gas, recently developed by the American Oxycop Co., Niagara Falls, N. Y. It has a cutting capacity of approximately 50 feet by 5 feet 3 inches. Outlines can be cut directly from a drawing or automatically from a templet of wood or metal. Straight lines and circles can be cut without the use of templets.

The machine is equipped with two identical main carriages which move longitudinally along the frame. Both of them are provided with auxiliary carriages that run transversely on the main carriages. Each of these carriage units is self-contained, having an individual driving mechanism, a cutting torch, and necessary accessories. They can be operated simultaneously from the same templet or used independently to give, in effect, two machines. The driving mechanisms and cutting torches are on the auxiliary carriages.

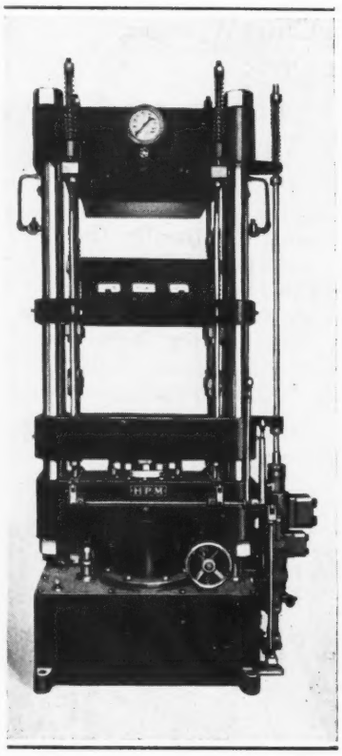


Fig. 2. Self-contained Hydraulic Press for Plastic Molding Service

Sebastian Rubber-Roll Grinding Machine

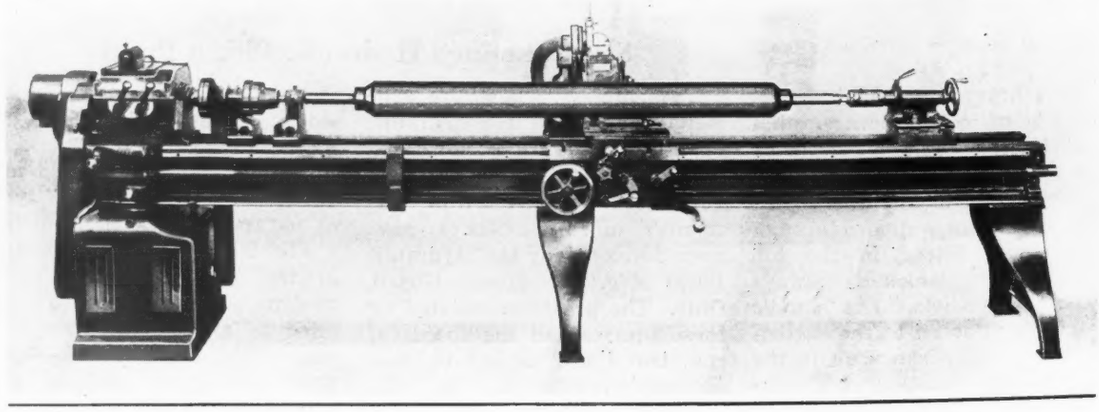
A lathe equipped for grinding and polishing the rubber rolls used in the printing industry, was recently built by the Sebastian Lathe Co., Cincinnati, Ohio, and is here illustrated. Standard lathe equipment was also furnished. Within ten minutes the special grinding device can be removed and the machine converted into a regular lathe for general maintenance work. This machine has a swing of 16 1/4 inches and takes work up to 11 feet 1 1/2 inches long. It is also built with a 20-inch swing.

An eight-speed, quick-change geared head provides the required range of speed. Power is supplied by a motor in the cabinet base.

After a roll has been ground, the grinding mechanism is released at the headstock end, and the belt from the motor to a pulley on the spindle is applied to give a polishing speed of 1200 revolutions per minute. Polishing is then performed by covering the roll with powdered soapstone and applying a piece of aluminum-oxide coated cloth by hand.

Forsberg Screwdrivers

A new line of low-priced "Super-Grip" screwdrivers is being placed on the market by the Forsberg Mfg. Co., Bridgeport, Conn. The method of fastening the blade in the handle prevents it from turning and loosening and also permits it to be hardened all the way up inside the handle. The blade is made of high-carbon steel. The handle is of maple with deep machine-cut grooves.



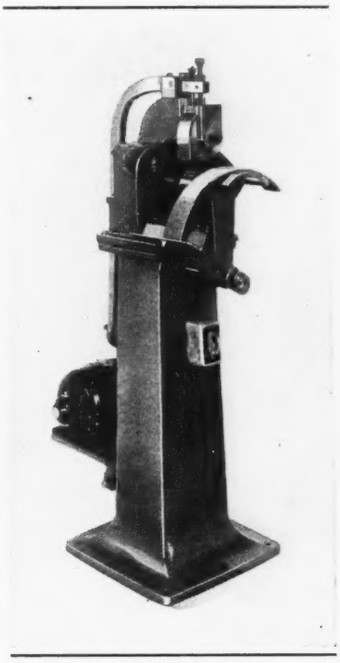
Sebastian Lathe which can be Used for Grinding and Polishing Rubber Rolls and also for General Maintenance Work

A machinist's screwdriver is made in 3-, 4-, 5-, 6-, and 8-inch sizes with the blade part way or altogether through the handle. An electric type of screwdriver is made in 4 1/2-, 6 1/2-, and 8 1/2-inch sizes.

Marking Machine for Molded Brake Lining

A machine for rolling a permanent mark into molded brake lining by the use of steel marking dies, was recently designed by the Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn. The customer's trade mark and the size of the brake lining are impressed. The lining is made in thicknesses of from 3/16 to 1/2 inch and in widths of from 1 1/2 to 6 inches.

The brake-lining sections are placed on a special guide for the operation. The marking die carries the lining forward automatically, rolls the mark in, and ejects the piece. This action is accomplished by using an eccentric die, with the trade mark and size figures on the high portion. The die is built in segment form so that changes can be easily made to suit different sizes of brake lining. The machine gives a production of from 50 to 75 pieces per minute. It is driven by a 1/4-horsepower motor and weighs about 350 pounds.



Machine for Marking Molded Brake Lining

Planigressive Speed Reducers

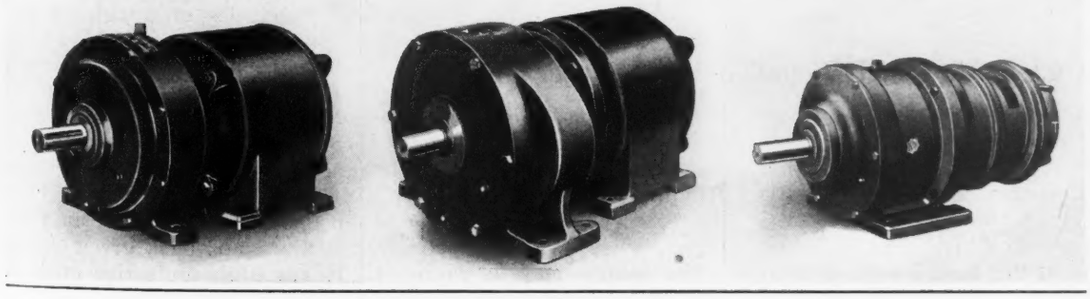
Speed reducers with simple and compound planetary gearing, and compound helical gearing are now made by the Davis & Thompson Co., 6619 W. Mitchell St., Milwaukee, Wis., and distributed nationally by the Planigressive Reducer Sales Co., 610 W. Michigan St., Milwaukee. The standard ratios are from 3 to 1 up to 600 to 1, but still greater ratios can be supplied. The reducers may be furnished complete with a motor or may be arranged to be mounted on a motor furnished by the customer. In all these speed reducers a standard motor can be used without any alterations. This is especially of advantage in case a motor must be replaced.

The reducers are made in the horizontal styles illustrated and also in vertical styles with the output shaft extending either up or down. The input and output shafts are in line. The same principles are used to obtain reduction in the vertical reducers as in the horizontal. Reducers with a right-angle drive are also made.

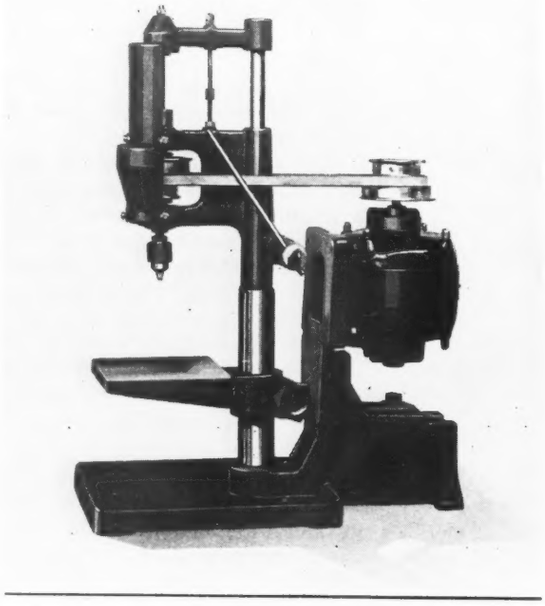
The Type A speed reducer, shown at the left in the illustration, is made in ratios from 3 to 1 up to 7 to 1. A simple planetary gearing system is used. This reducer unit is made integral with the motor. All sizes up to 3 horsepower are constructed without feet on the reducer housing. Larger sizes have feet as shown.

The Type B reducer, shown in the middle of the illustration, is provided with compound gearing for obtaining reduction ratios from 7 to 1 up to 24 to 1. This unit can also be supplied for increasing speeds instead of reducing them, in ratios from 1 to 1.1 up to 1 to 5. Helical gears are used throughout.

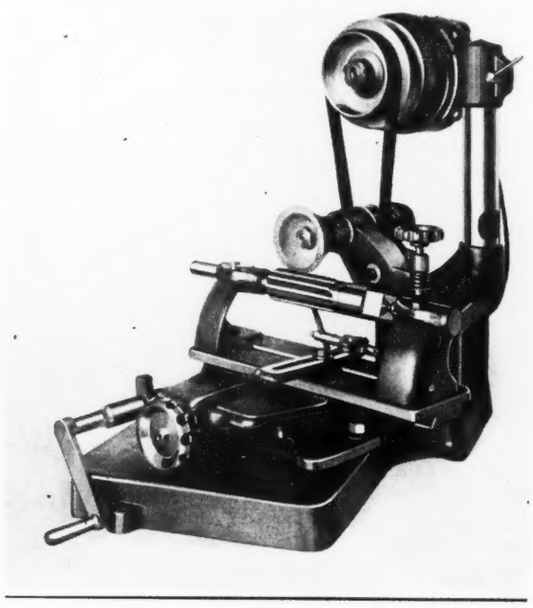
The Type D speed reducer, seen at the right, is called the "high-reduction" speed reducer, because ratios ranging from 25 to 1 up to 600 to 1 are standard for this design. Special units of higher ratios are also made in this design. Compound planetary gearing is employed.



Three Types of Planigressive Speed Reducers, Made in Standard Ratios from 3 to 1 up to 600 to 1



Langelier Drilling Machine with Full Ball-bearing Spindle



Clematic Tool and Cutter Grinder with Detachable Grinding Head

Langelier Sensitive Drilling Machine

A sensitive drilling machine with a full ball-bearing spindle is being placed on the market by the Langelier Mfg. Co., Providence, R. I. This machine can be supplied with a belt or motor drive and for use either on a bench or on a floor stand. A treadle can be furnished for foot control.

The machine is rated at 1/4-inch capacity. On the single-speed belt-driven model, the speed is 2500 revolutions per minute, while on the motor-driven model, speeds of 1250, 2250, and 3500 revolutions per minute, or 2500, 4500, and 7000 revolutions per minute are available. Belt pull on the spindle is avoided by mounting the spindle pulley on a sleeve equipped with ball bearings at both ends. Alemite fittings are provided for lubricating the bearings. An adjustment for belt take-up is provided on the motor bracket. The motor-driven unit may receive power from a light socket.

The distance from the column to the spindle is 4 inches, thus giving a swing of 8 inches. The total feed of the spindle is 2 1/2 inches, and the greatest distance from the chuck to the table is 6 1/2 inches. The weight of this machine, equipped with a motor, is 90 pounds.

Clematic Bench Type Tool and Cutter Grinder

A motor-driven bench type of tool and cutter grinder has been added to the line of grinding equipment made by the Clematic Mfg. Co., 5311 Woodland Ave., Cleveland, Ohio. The grinding head of this machine is a detachable unit which may be mounted on the compound rest of a lathe, as well as on the compound rest of this machine. There is a two-inch adjustment from front to back and from right to left. The grinding head can also be swiveled on a center for grinding to angles.

The spindle may be equipped with either bronze or ball bearings and has a preloaded feature designed to overcome end motion. The spindle can be adjusted vertically 2 1/2 inches through a worm and gear. Four spindle speeds are provided, namely, 3500, 4400, 6300, and 7600 revolutions per minute.

The compound table has a working surface of 4 1/2 by 16 inches. A longitudinal hand travel of 8 inches is provided and a cross travel of 3 inches. The unit is equipped with a 1/4-horsepower, 110-volt, single-phase motor, but a 1/2-horsepower motor can be supplied.

Goggles for Use in Welding

Spectacles or goggles with a new type of lens have been brought out by the Linde Air Products Co., 30 E. 42nd St., New York City, for protecting the eyes of operators in oxy-acetylene cutting and welding. The new lens is flat-ground and polished, and is made in light, medium, and dark green shades. It has high protective qualities and is known as Type AA. Type A or B lenses can also be furnished.

The lenses are mounted in a canvas Bakelite frame and are approximately two inches in diameter. This width permits a wide angle of vision and gives full protection against light and sparks. The temples or bows are covered with insulating material, while the frame is non-inflammable and does not conduct heat. By means of a snap device, the frame can be spread to permit changing lenses within a few seconds.

Cleveland Spiral-Bevel Gear Cutting Machine

In a spiral-bevel gear cutting machine being introduced on the market by the Cleveland Hobbing Machine Co., 1170 E. 152nd St., Cleveland, Ohio, the cutter and gear blank are rotated in continuous cutting engagement with each other and are given the required relative movements to effect complete cutting of the teeth in the blank. A stepped cam feeds the work a predetermined amount for each revolution of the blank. A hob speed of 40 revolutions per minute is used in cutting a conventional 37-tooth spiral-bevel gear.

From 3 to 5 revolutions of the blank, depending on the kind of material, are required to complete the operation. The hob makes 37 revolutions for each step in the cam. After the blank has been fed by means of the cam to the proper depth for any revolution of the blank, the work remains in that position until the hob has passed through the 37 teeth.

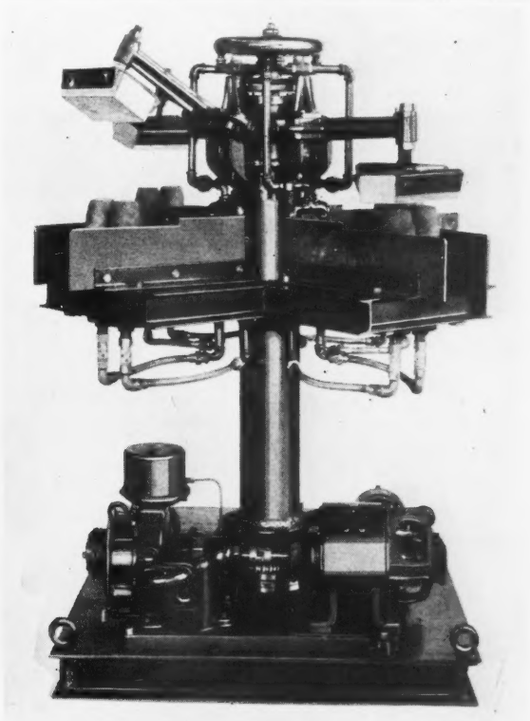
The hob is a disk with cutting teeth extending in a direction parallel with the axis of the cutter. The teeth are arranged in a spiral, the lead of which equals the circular pitch of the gears being cut. The teeth are of different widths or thicknesses. The first few teeth are stepped down so that their cutting action is similar to the action of a broach cutting a keyway. The teeth which follow the stepped teeth generate the proper tooth form in the gear blank. Gears up to 12 inches in outside diameter and with teeth ranging from 8 to 3 diametral pitch can be cut.

Although the machine illustrated is a single-spindle type, multiple-spindle machines are also built. The multiple-spindle machines are of a rotary type. The single-spindle machine weighs 7000 pounds.

Automatic Annealing Machine

An automatic gas-fired annealing machine designed for spot-heating parts up to 2 feet in diameter, has recently been developed by the Selas Co., 18th St. and Indiana Ave., Philadelphia, Pa., in cooperation with P. R. Hoopes, consulting mechanical

Cleveland Single-spindle Spiral-bevel Gear Cutting Machine

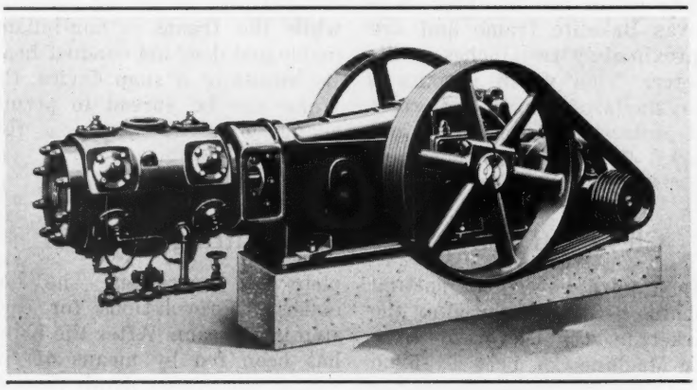


Automatic Machine Designed for the Rapid Annealing of Parts

engineer. The machine, which is here illustrated, is a self-contained, power-driven unit equipped with eight adjustable burners. These burners are supplied with gas that is premixed with air by a standard Selas machine. Each burner consumes at the rate of 100 cubic feet of gas per hour while heating work, but it is throttled to about 15 cubic feet per hour during loading.

Individual adjustments are provided for the burners and work fixtures so that the burners may be placed in any desired relation to the parts being heated. Each burner is furnished with a manually operated shut-off cock in addition to the automatic throttling valves that control the heating cycle. Insulating refractory baffles reflect the heat down on the work, accelerating the rate of heating and localizing the heated areas.

The work is fed into the machine by an operator and delivered at the rate of six pieces a minute. The machine rotates continuously from left to right, the burners being automatically turned on and throttled down, and the baffles are automatically moved in and out of the operating positions. In addition to reduced annealing costs, uniform heating of the work is an advantage claimed. With slight adjustments, the burners can be arranged to operate on any commercial gas fuel.



Ingersoll-Rand Single-stage Compressor Made in Sizes of from 10 to 125 Horsepower

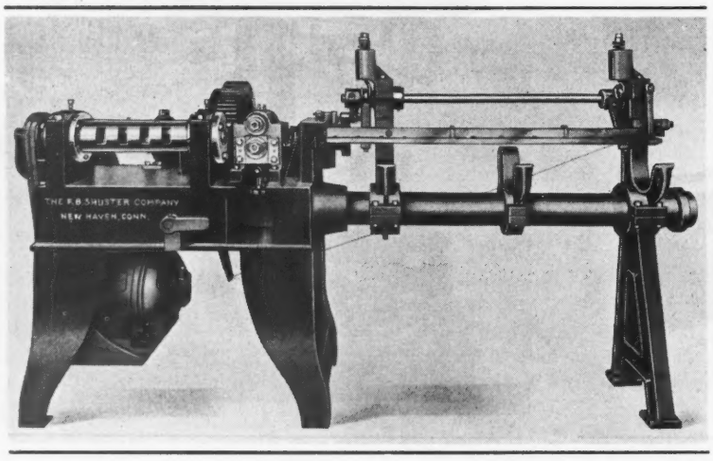
Ingersoll-Rand Heavy-Duty Compressor

A Class ES single-stage belt-driven air or gas compressor designed for heavy-duty service, is being introduced to the trade by the Ingersoll-Rand Co., 11 Broadway, New York City. This compressor has one horizontal double-acting cylinder and operates at moderate speeds. It is available in sizes of from 10 to 125 horsepower, which give discharge pressures from 5 to 150 pounds per square inch.

The equipment is particularly intended for full-load continuous service. It is well adapted for use in isolated plants where there is little supervision, in applications where oil is objectionable in the discharge line, and in installations where a future change in pressure conditions may require a different cylinder size. A double row of Timken tapered roller bearings carries each end of the crankshaft.

Shuster High-Speed Automatic Wire Straightening and Cutting Machine

In a high-speed automatic wire straightening and cutting machine recently developed by the F. B. Shuster Co., New Haven, Conn., there is an almost continuous movement of the wire, brought about by the use of a special cut-off cam and a clutch that is practically instantaneous in operation. High speed is obtained in the cut-off because the cover which closes the guide bar (the bar in which the wire is fed to be cut off) is operated independently of the cut-off lever. The guide bar itself is fixed to the uprights. The straightening "flier," the flywheel, and the high-speed driving shaft are mounted in ball bearings. The feed rolls are adjusted through an opening in the bed of the machine. The lower roll boxes are released at the time of cutting off. Breaking rolls may be supplied if desired. The extension is of standard construction with forked holders.



Shuster Wire Straightening and Cutting Machine of High-speed Design

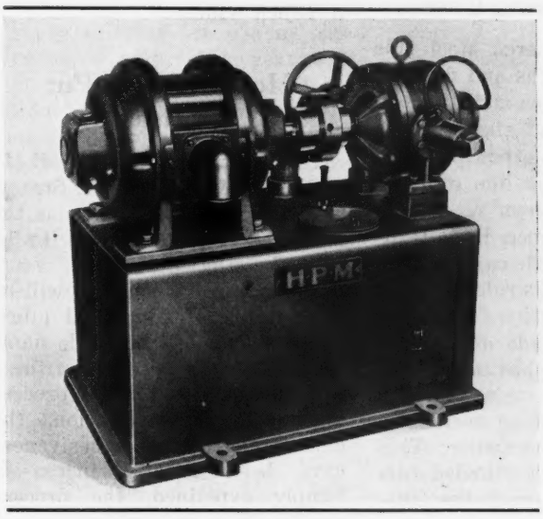
Hydraulic Power Units for Machine Drives

A line of standardized "Hydro-Power" units has been developed by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, to facilitate the application of the H-P-M radial oil-pressure pumps (described in June MACHINERY, page 683) to various types of hydraulically actuated machines. In each "Hydro-Power" unit one of these radial pressure generators is direct-driven by an electric motor through the use of a flexible coupling. As illustrated, both the motor and pump are mounted on a base formed of steel plate and welded.

The base also serves as a reservoir for the oil, which is used both as a pressure fluid and as a lubricant. The reservoir is fitted to receive a copper coil for circulating cooling water.

The pressure of the radial pump is regulated by means of an automatic control, within the operating limits, up to a maximum of 3000 pounds per square inch. A modified form of this control is provided with a second adjustment whereby the volume of the pump discharge can be regulated from zero to the maximum.

This type of power unit provides a single stage of high pressure up to 3000 pounds per square inch or a medium pressure up to 1500 pounds per square inch, depending upon the pump supplied. When initial work or closing movements are to be performed at low pressure, a two-stage unit is recommended, which, in addition to the high- or medium-pressure radial pump, includes a low-pressure rotary pump that provides a larger volume of oil for the initial portion of the operation.



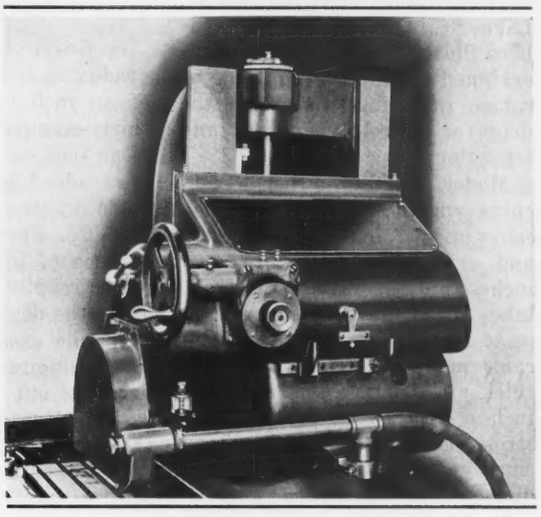
Self-contained Hydraulic Power Unit for Various Types of Machines

Simplified Reversing Mechanism for Thompson Surface Grinding Machines

The hydraulic surface grinding machines manufactured by the Thompson Grinder Co., 1534 W. Main St., Springfield, Ohio, are now equipped with a simplified form of reversing mechanism which is applied to the wheel-head. The machines themselves were described in March, 1933, MACHINERY, page 488, and November, 1931, MACHINERY, page 223.

In the new reversing mechanism, dogs are mounted on the wheel-head as illustrated. These dogs can be adjusted to give any required cross-feed stroke. A manual control of the wheel-head reversal is available through a knob and dial on the front of the wheel-head bracket. By moving the knob, the reversing lever is disengaged from the path of the dogs so that the wheel-head may be reversed.

Feeding of the wheel-head by means of the handwheel is accomplished by engaging a splined clutch and shifting the control knob to an indicated position at which the oil pressure in the wheel-head cylinder does not interfere with movement of the handwheel. The mechanism is enclosed within the head bracket and is thus effectively sealed against grit.

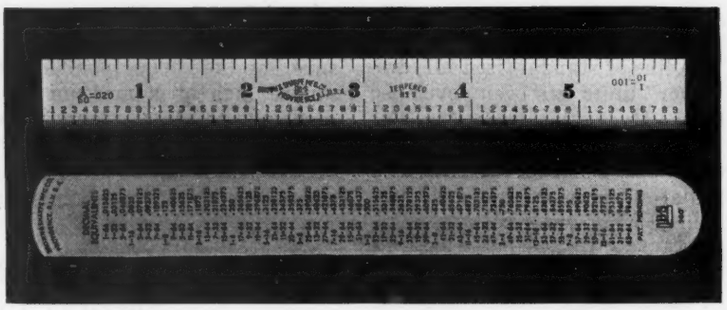


Thompson Hydraulic Surface Grinders now Have a Simplified Reversing Mechanism

Solder for Stainless Steels

A solder intended primarily for use in soldering stainless-steel, Monel metal, and chromium-plated parts, is being placed on the market by the Berry Solder Co., Inc., 19 Rector St., New York City. This Stanochrom solder is of the acid-core type. It was developed in cooperation with several users of

non-corrosive steel. A precaution mentioned in connection with the use of this solder is that upon the completion of an operation, the end of the solder should be thoroughly closed; otherwise, the flux content will come out of its own accord.



New Steel Rule and Aluminum Rule Case Brought Out by the Brown & Sharpe Mfg. Co.

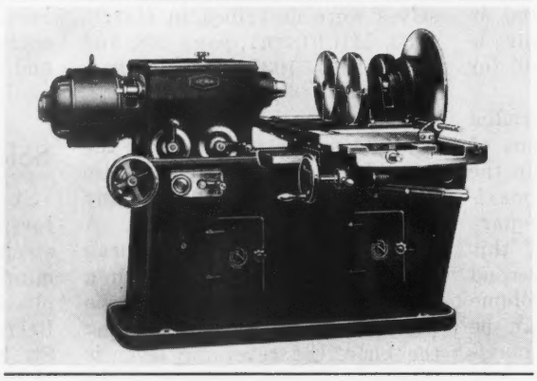
Curd Nube Automatic Cam Cutting Machine

An automatically controlled cam cutting or milling machine is being placed on the market in three sizes by the Curd Nube Machine Co. of America, 117 W. Lake St., Chicago, Ill., and is here illustrated. This machine is designed for milling all kinds of cams, including those of the drum or barrel type or of any irregular shape.

Model KF-0 is a bench machine which accommodates disk cams up to 7 inches in diameter and cylindrical cams up to 4 inches in diameter. Model KF-1 takes either a disk or barrel cam up to 11 inches in diameter. Disk cams may be up to 13/16 inch thick and barrel cams up to 12 inches long, with a maximum stroke of 6 inches. This machine employs cutters up to 1 inch in diameter. It weighs 2860 pounds.

Model KF-2 has a maximum disk capacity of 22 inches, while barrel cams up to 12 inches in diameter by 12 inches long can also be handled. The maximum cam stroke is 7 inches. Cutters up to 1 inch in diameter can also be used on this machine and it weighs 3410 pounds.

These machines are capable of copying directly from a pattern or from an old or worn-out cam. By using patterns larger than the work, accuracy of form and shape is insured. The spindle is geared directly to the pattern. The copying mechanism on these machines is the same as on the vertical type KF-3 machine made by the same company.



Cam Cutting Machine Built in Three Sizes for Reproducing from Master Patterns or Worn Cams

Six-Inch Rule and Pocket-Saving Case

A 6-inch tempered steel rule graduated in tenths and fiftieths of an inch on one side and in thirty-seconds and sixty-fourths of an inch on the other side, has been added to the line of rules made by the Brown & Sharpe Mfg. Co., Providence, R. I. Hundredths of an inch can be estimated readily. This rule has been given the designation "No. 315."

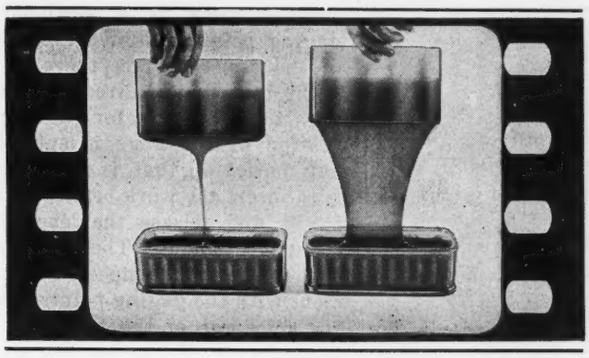
A rule case made of dull-finished aluminum has also been brought out by this concern, with a view to saving pockets in the clothing of the owner. This case is made with rounded corners, as may be seen in the illustration, where the case is shown at the bottom. Decimal equivalents are given on the back of the case. A rule may be conveniently slid from the case by applying slight thumb pressure through a slot on the front side. The case is made for 6-inch rules up to 0.045 inch thick and up to 3/4-inch wide.

Houghton Sta-Put Lubricants

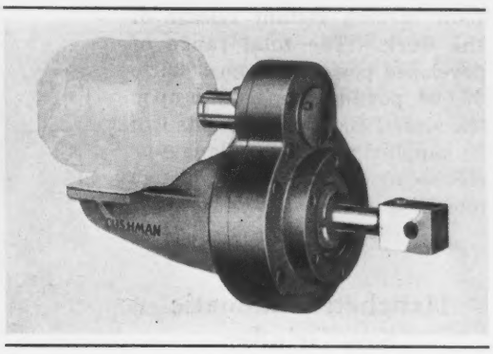
One of the exhibits of E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa., at the National Metal Congress to be held in Detroit, Mich., from October 2 to 6 inclusive, will be a new line of industrial lubricants known by the trade name of Sta-Put. The feature of these lubricants is that by a process known as polymerization, the film strength and adhesiveness have been greatly increased. Simply explained, the process results in a re-arrangement of the molecules in an oil without changing its chemical content. This brings about a closer bond between all the molecules.

The illustration, which was taken from a moving picture film, compares the film-forming properties of an ordinary mineral oil (at the left) with the same oil after it has been given the Sta-Put treatment.

These lubricants are made in three series. The 300 Oil Series is made in ten grades, varying in consistency from light machine oils to heavy oils intended for slow-moving bearings. The 400 Gear Oil Series is made in eight special grades suitable for all gears, speeds,



Comparison of the Film-forming Properties of a Mineral Oil Before and After the Sta-Put Process



Cushmatic Power Unit for Producing Straight-line Motion

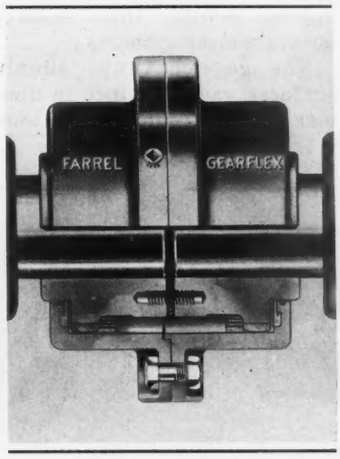
and loads. These oils are especially suitable for use in speed reducers and other gear units operating at high speeds and under extreme tooth pressures. The 500 Grease Series is intended for use in screw-down grease cups for all automatic pressure lubricating systems. They will feed freely through any system, are free of moisture, and will not harden or turn rancid.

Farrel Gearflex Couplings

A flexible coupling of the gear type known by the trade name of "Gearflex" is being introduced on the market by the Farrel-Birmingham Co., Inc., 377 Vulcan St., Buffalo, N. Y. The double-engagement type illustrated consists essentially of two hubs which are keyed to the shafts to be connected. External gear teeth on these hubs engage internal gear teeth of a floating sleeve which encases the hubs. With these two sets of spur gears, one at each end of the floating sleeve, misalignment is compensated for by the sleeve assuming a neutral position between the two shafts. Thus, all whip or crank action is eliminated, relieving the bearings and shafts of heavy pressures and vibration. The external and internal spur gears are accurately cut in a Sykes gear generating machine and insure proper distribution of the load over a large number of contact surfaces.

There is a large reservoir between the hubs and the floating sleeve for lubricant. When the coupling rotates, centrifugal force throws the oil to the inner surface of the floating sleeve, from which it spreads between the gear teeth, immersing all load carrying surfaces in a bath of oil. It is claimed that the oil provides a cushioning effect which gives a high degree of quietness and reduces wear.

The Gearflex coupling is also made in a single-engagement type, in which only one hub is provided with gear teeth for engaging teeth in the sleeve, the other hub being solid and the sleeve being bolted to it. This single-engagement type was designed to provide a low-cost coupling for applications where the high-speed capacity and high degree of flexibility of the double-engagement type are not needed.



Gearflex Coupling of Double-engagement Type

Cushmatic Pull-Push Power Units

A non-rotating power unit that will push or pull a load at a constant pressure for the full length of its stroke has been developed by the Cushman Chuck Co., Hartford, Conn. This unit is applicable to many industrial purposes, including the clamping of fixtures and the operation of vises, arbor presses, jacks, etc. It may also be used to operate clamps on shears, welding machines, or other equipment, and can be applied to molding machines used for producing parts from synthetic plastics, rubber, clay, etc.

The unit consists essentially of a high-torque ball-bearing alternating-current motor which transmits power through a coupling of unusual design. One end of the coupling is attached to the motor shaft and the other to a pinion that meshes with a gear mounted on a rotatable nut. The gear makes a partial revolution before it transmits power to the nut. Motion of the nut is imparted through a screw thread to a draw-bar. The bar is moved either forward or backward, depending upon the direction in which the motor is run. The draw-bar, in turn, moves the clamp or other member to which it is attached. The unit may be installed on a machine in any position from vertical to horizontal.

One of the important features of the unit is that a hammer

blow insures instant release of the work. The total range of developed power is from 3000 to 35,000 pounds, depending upon the size of the motor. Units can be supplied with base, flange, or clevis mountings. The flange mounting is shown.

Hanchett Automatic Saw Grinder

A No. 21 automatic grinder for sharpening small metal-cutting saws, singly or in gangs, has been brought out by the Hanchett Mfg. Co., Big Rapids, Mich. Saws of the same size and with the same tooth spacing are lined up on an arbor at the front of the machine and ground in one setting. The entire gang of saws is automatically indexed, one row of teeth at a time, and the wheel grinds the full line of teeth as the slide reciprocates. The wheel is shaped to sharpen the tooth points and "gum" the throats in one operation. Vertical adjustment of the grinding wheel is effected by means of a handwheel and its position is locked with a nut.

The wheel spindle is fitted with double-row precision ball bearings that are protected against dust and grit. The load on the spindle bearings from tension on the belt is uniformly maintained by a spring device. Index-plates considerably larger than the saws, and with index teeth larger than the saw teeth, are used, so as to give a high degree of accuracy, especially when grinding saws with fine teeth. It is claimed that the machine will grind a gang of saws to the specified diameter within plus or minus 0.001 inch.

Sharpener for Small Metal-cutting Saws

Federal Thickness Gage

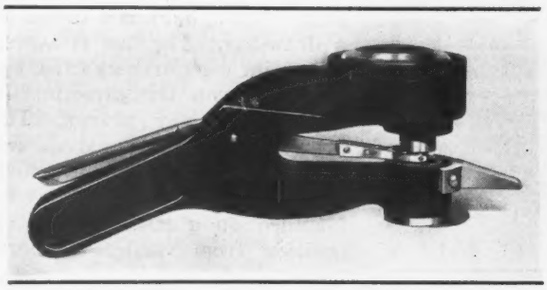
A thickness gage that clamps the material beirg measured before the measuring anvils come into contact with it is the latest development of the Federal Products Corporation, 1144 Eddy St., Providence, R. I. This design eliminates relying upon human touch and determines when the material being gaged is in true alignment with the gaging points, thus insuring accurate measurements.

The gage has two aligning surfaces, each 3/4 inch in diameter. In the center of the lower surface there is a stationary gaging point, and in the center of the upper surface there is a point that makes direct contact with the dial indicator. The operation of the gage is entirely automatic; all that is necessary is to insert the work between the anvils and release the lever on the gage handle. The material is then securely clamped in alignment with the gaging points, and the thickness of the material is immediately shown on the dial indicator. The indicator is equipped with two tolerance hands which can be set for any desired limits to facilitate gaging operations.

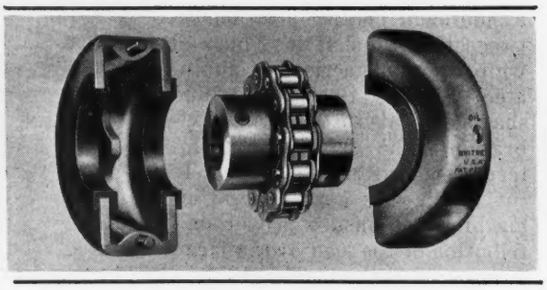
Whitney Roller-Chain Flexible Coupling

A flexible coupling which consists of two accurately cut sprockets coupled together with roller chain, is being placed on the market by the Whitney Mfg. Co., Hartford, Conn. Proper clearance between the two sprockets allows for slight shaft misalignment. This clearance also permits a certain amount of motor end-float without binding or shaft distortion. The construction permits quick installation or dismantling of equipment.

A rotating type cover of simple design insures proper lubrication and protection from dirt, grit, and other abrasive materials, thus prolonging the life of the coupling. In addition, the cover insures safety and improves the appearance of the machine drive in which the coupling is employed.



Thickness Gage that Clamps the Work before Measuring it

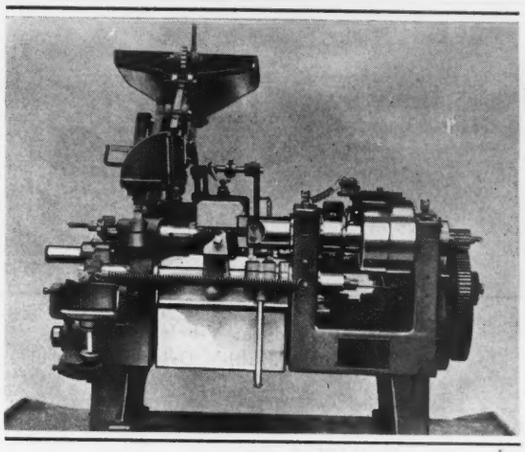


Roller-chain Flexible Coupling Made by the Whitney Mfg. Co.

Townsend Wood-Screw Pointer

Single, double, and triple threads can be cut on wood screws in an improved screw pointer and threader recently developed by the H. P. Townsend Mfg. Co., Hartford, Conn. Without abnormally high spindle speeds, this machine gives high rates of production. The cams and tool movements are arranged to eliminate all unnecessary lost time.

Over-size or under-size screw-heads are held firmly by toggle-operated jaws. There is no danger of crushing over-size heads and the jaws close tightly on somewhat under-size heads. The jaw-grips in the spindle can be adapted to hold two or three different sizes of screw-heads by a simple adjustment.



Improved Townsend Wood-screw Pointer and Threader

Totally Enclosed Fan-Cooled Motor

The Ideal Electric & Mfg. Co., Mansfield, Ohio, has developed a totally enclosed, fan-cooled motor that is of the same size as the ordinary open-type motor of the same rating. Full protection is provided against explosive, abrasive or current-carrying dust; corrosive gases or fumes; steam; and moisture. For this reason, the motor is especially suitable for use in machine shops, steel mills, foundries, grain elevators, laundries, etc.

The motor is made with two shells, there being an inner shell that encloses the windings and the rotor. Tight sealing is obtained with machined metal-to-metal stationary joints. A fan forces a blast of air between the two shells for cooling effectively. The motor is made in sizes from 1 to 200 horsepower.

Brown Circular-Chart Thermometers and Pressure Gages

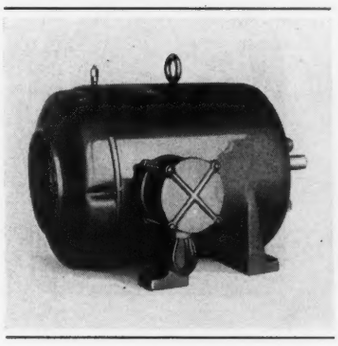
A line of 8- and 12-inch circular-chart instruments just placed on the market by the Brown Instrument Co., Philadelphia, Pa., includes thermometers in indicating and recording types for temperatures from –40 degrees F. up to 1200 degrees F., and indicating or recording pressure and vacuum gages for ranges from 10 inches of water up to 5000 pounds per square inch. All types are offered in one-, two-, or three-pen models.

In the thermometers, the mercury-filled helix is made of a stainless steel which stands 100 per cent overload and provides a surplus of power to move the pen. The gas and vapor type helices are made of heat-treated phosphor-bronze.

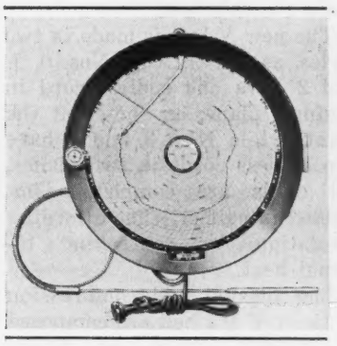
In the pressure and vacuum gages, one of three different types of actuating movements is employed—a flexible metal diaphragm, a spring-opposed bellows, or a helix—depending upon the range. An electric clock is standard for all models, but for installations where alternating current is not available, hand-wound clocks are furnished.

Emerson Capacitor Motors

The Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo., has recently introduced on the market a line of high-torque capacitor motors of the construction illustrated.



Completely Sealed Fan-cooled Motor Made with Two Shells

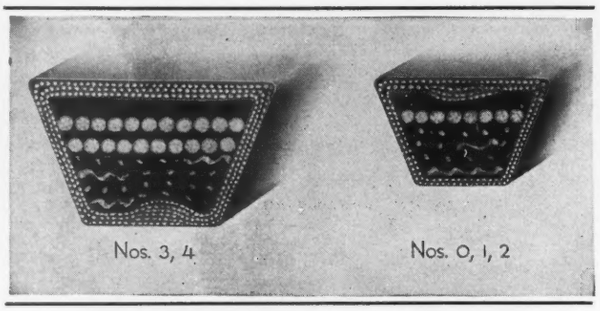


Instrument for Recording Temperature, Pressure, or Vacuum

Capacitor Motor Made in Sizes from 1/8 to 1/3 Horsepower

These new motors follow closely the basic design of the low-torque fan-duty capacitor motors made by the same concern, but they include a number of refinements. They are made in sizes ranging from 1/8 to 1/3 horsepower.

These motors have the performance characteristics of a repulsion-induction motor plus added quietness and less complicated construction. They are particularly suitable for operating electric refrigerators, certain types of oil burners, pumps, etc. They are designed to avoid radio interference. Either resilient or rigid mountings can be supplied.



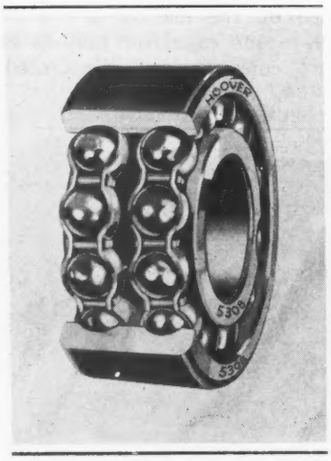
Two Styles of Goodyear V-belt Used in Worthington Multi-V Drives

Hoover Double-Row Ball Bearings

Double-row annular ball bearings, of the construction illustrated, have been added to the lines of single-row ball bearings and tapered roller bearings made by the Hoover Steel Ball Co., Ann Arbor, Mich. The new bearings are made in the S A E light, medium, and heavy series, identified as Nos. 5200, 5300, and 5400.

The bearings are of the deep-groove type, without filling slots or interrupted raceways. They have a large thrust capacity in either direction, in addition to the radial capacity. It is claimed that the accuracy of the inner and outer rings is so great that each row of balls will carry its share of the total load from the standpoint of both radial and thrust loads.

Formed steel retainers of the riveted type maintain the desired spacing between the balls. The entire bearing is produced from electric furnace high-carbon chrome-alloy steel.



Hoover Ball Bearing of Double-row Type

Worthington Drives with Improved Goodyear V-Belt

An improved Goodyear Emerald cord V-belt is now being applied to the multi-V drives manufactured by the Worthington Pump & Machinery Corporation, Harrison, N. J. High power capacity, long flexing life, uniform cross-section, and low stretch are the principal claims made for this belt.

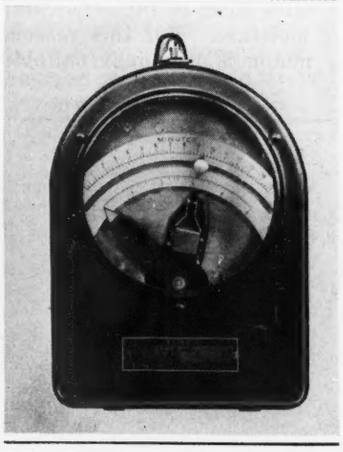
The new V-belt is made in two styles, as illustrated. Nos. 0, 1, and 2 have one endless cord in a single plane, as shown at the right, while Nos. 3 and 4 have two endless cords in two planes. All cords are completely imbedded in rubber, thus affording insulation for controlling internal heat.

The tension and compression sections of the belt are composed of rubber, layers of fabric being distributed through the compression sections to prevent excessive flexibility. The belt is molded to shape and is completely enclosed in a fabric envelope which protects the working elements and provides a good contact surface for the V-grooved sheaves. The envelope fabric is cut on the bias to prevent the envelope from taking any part of the load and thus protect it from rupture. The contact faces are unbroken.

Automatic Electric Timer

An electric timer that lends itself to numerous automatic and remote control applications has recently been produced by the General Electric Co., Schenectady, N. Y. By combinations of two or more timers or by using one timer in conjunction with other types of automatic time switches, an automatic control can be provided for a wide range of processes.

Timing is started by closing a switch, the timing period being adjustable over a wide range. Resetting is effected automatically when the control circuit is de-energized. The device can be arranged to operate a signal or terminate the process at the end



Automatic Timer Made by the General Electric Co.

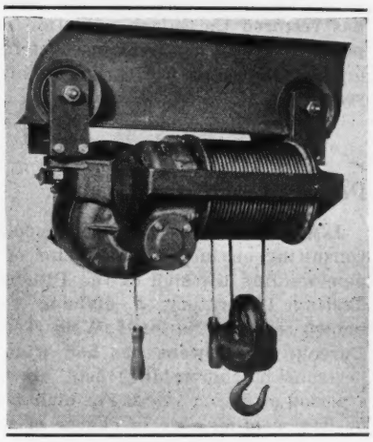
of a predetermined period. The two scales are graduated in hours or minutes, as desired. One scale has a range three times that of the other to give a wide range of time-interval selection.

The timing element is a Telechron motor, which is self-starting and synchronous.

Electro Lift Junior Overhead Hoist

A Junior model overhead electric hoist with a capacity of 500 pounds is being introduced on the market by Electro Lift, Inc., 30 Church St., New York City. This hoist may be equipped with a top hook for rigid overhead suspension or it can be furnished with a plain trolley for use on any monorail track. Its small size and compactness permit it to be readily moved from one location to another.

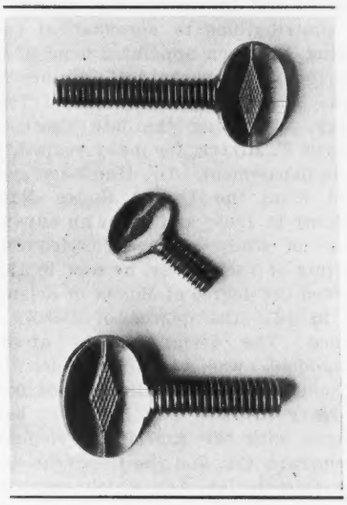
The noiseless single-worm drive of the larger hoists made by the concern is also a feature of the new hoist. All parts are totally enclosed and roller bearings are provided throughout. The gears and bearings operate noiselessly in grease. The hoist is balanced at all loads and has a steel suspension. A motor brake and electric limit switch provide an automatic stop that prevents over-travel of the hook at the top of the lift. Either a rope or push-button control may be furnished.



Hoist of 500 Pounds Capacity Added to the Electro Lift Line

Parker-Kalon Cold-Forged Thumb-Screws

Thumb-screws, cold-forged by a new process that is said to eliminate common defects, are being introduced to the trade by the Parker-Kalon Corporation, 200 Varick St., New York City. They are regularly made in sizes from 3/16 inch (24 threads per inch) by 1/2 inch long up to 3/8 inch (16 threads per inch) by 3 inches long. The screws are roll-threaded within close limits. Screws with threads or points other than those stocked can be made special and screws can be made of various alloys to suit individual requirements.

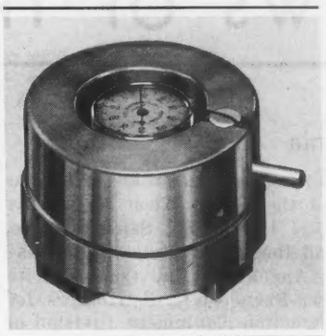


Parker-Kalon Cold-forged Thumb-screws

The thumb-grips are knurled as illustrated to permit a firm hold. As these thumb-screws are free from burrs and roughness, they can be readily plated to enhance their appearance.

Starrett Vibrometer

A compact inexpensive instrument for measuring the amplitude of vibration in machinery and power equipment is the latest development of the L. S. Starrett Co., Athol, Mass. This Vibrometer is particularly useful for checking the balance of units revolving at high speeds, such as turbine rotors, by means of simple comparative readings. All parts of the Vibrometer are nickel- and chromium-plated. A carrying case is provided for protection and convenience.



Starrett Vibrometer for Determining the Amplitude of Vibration

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Coated Abrasives Made by a New Process

Artificial abrasives, such as aluminum-oxide and silicon-carbide, or the natural abrasive garnet are now being coated on paper, cloth, or combination backings by an electro-static process. This process imbeds the abrasive grains in the backing with all points up so that the maximum number of cutting edges can be presented to the surface to be sanded or finished. The new process also distributes the abrasive grains evenly over the backing, which results in smoother cutting and eliminates scratching of work. It is claimed that due to these improvements the new coated abrasives show an increased efficiency ranging from 20 to 60 per cent.

These coated abrasives come in forms to fit standard power and hand tools, as well as in sheets that may be cut to fit special needs or used manually. They are made by the following concerns: The Armour Sand Paper Works, 1355 W. 31st St., Chicago, Ill.; the Behr-Manning Corporation, Troy, N. Y.; the Carborundum Co., Niagara Falls, N. Y.; and the Minnesota Mining & Mfg. Co., St. Paul, Minn.

NEWS OF THE INDUSTRY

California

CHAIN BELT CO., Milwaukee, Wis., has appointed the H. C. WOOD MACHINERY WORKS, 514 Bryant St., San Francisco, Calif., and the BROWN-BEVIS EQUIPMENT CO., Los Angeles, Calif., (successor to the BROWN-BEVIS CO.), distributors for the Construction Equipment Division of the company.

Illinois, Missouri, and Wisconsin

YALE & TOWNE MFG. CO., Chrysler Bldg., 405 Lexington Ave., New York City, announces the purchase of the real estate, machinery, tools, inventory, patents, and good will of the WALKER VEHICLE CO. and the AUTOMATIC TRANSPORTATION CO., of Chicago, manufacturers of industrial electric trucks and commercial electric street vehicles. The Yale & Towne Mfg. Co. will continue the manufacture and sale of the complete line of each company at 101 W. 87th St., Chicago, retaining the present personnel, with F. H. Tinsley in charge.

LANDIS TOOL CO., Waynesboro, Pa., is conducting an exhibit and demonstration at the show room connected with the company's Chicago office, 618 W. Washington Blvd. Two recently developed Landis grinders are demonstrated under power, one of which is equipped with the new Landis air sizing device. Included in the exhibit is a display of typical parts ground on Landis machines.

GEORGE L. BRADLEY CO., Rockford, Ill., is a new sales agency organized by George L. Bradley, who was formerly connected with the Sales Department of the Ingersoll Milling Machine Co., Rockford, Ill. The new company will represent the Davis & Thompson Co., the Rehnberg-Jacobson Mfg. Co., and the Rockford Machine Tool Co.

CHAIN BELT CO., Milwaukee, Wis., has moved its St. Louis office from 339 N. Taylor Ave. to 5475 Cabanne Ave. The St. Louis branch has been operating under the direction of FITCH S. BOSWORTH since the first of the year. The territory under the supervision of this office consists of the southern half of Illinois, the eastern half of Missouri, and the southwestern corner of Iowa.

CHAIN BELT CO., Milwaukee, Wis., writes us that the company has received orders for, and is building, twenty-one specially designed Rex Moto-Mixers, twenty-eight Rex-Stearns belt conveyors, and a Rex super-size mixer for the construction of the San Francisco-Oakland Bridge which, when completed, will be the longest in the world, and is one of the outstanding engineering undertakings of all times.

Massachusetts

DR. JEROME CLARKE HUNSAKER, vice-president of the Goodyear Zeppelin Corporation and internationally known for his contributions to aeronautical engineering, has been appointed head of the department of mechanical engineering of the Massachusetts Institute of Technology, succeeding the late PROFESSOR EDWARD F. MILLER, for many years head of the department. Dr. Hunsaker graduated from the United States Naval Academy in 1908; and, after an advance course of study at the Massachusetts Institute of Technology, he was, in 1912, awarded the degree of Master of Science, and in 1916 the degree of Doctor of Science. The design of the airship *Shenandoah* was prepared under Dr. Hunsaker's direction. He resigned from the Navy in 1926, and has later been engaged with the American Telephone & Telegraph Co., and the Goodyear Zeppelin Corporation, for which organization he will continue to act in the capacity of consulting engineer on airships.

COPPUS ENGINEERING CORPORATION, Worcester, Mass., manufacturer of blowers and steam turbines, has appointed John O. Weber, 122 Main St., Louisville, Ky., representative for the state of Kentucky, with the exclusion of a few counties which are served from the Cincinnati office. Mr. Weber will handle the entire Coppus line of forced-draft and ventilating blowers, cooling fans, steam turbines, and turbo-generators.

Michigan

WHITMAN & BARNES, INC., manufacturers of twist drills, reamers, cutters, punches, and other tools, established in 1854 and having factories in Detroit, Mich., and Walkerville, Ontario, announce the acquisition of three subsidiaries—the LATROBE TOOL MFG. CO., Latrobe, Pa., manufacturer of drills and reamers, the J. M. CARPENTER TAP & DIE CO., Pawtucket, R. I., manufacturer of taps, dies, and screw plates, and the VALLEY FORGE STEEL & TOOL CO., Chicago, Ill., a tool-distributing organization dealing chiefly in twist drills, reamers, taps, and dies. No consolidation of the manufacturing and sales organizations of the four companies is contemplated. CLARENCE AVILDSEN has been elected chairman of the board of directors; M. J. KEARINS has been elected president, succeeding WILLIAM H. EAGER who retires as an active officer, although remaining on the board of directors; EARL F. REINHART and ERIK ANDERSEN have been elected vice-president and treasurer, respectively, succeeding KARL KENDIG, who also retires as an active officer, although remaining on the board of directors. HARRY J. COGSWELL continues as president of the Valley Forge Steel & Tool Co.

New York

F. W. ALTORFER has been appointed eastern district sales manager for the National Acme Co., with headquarters in New York City. WILLARD A. JOHNSON, for some years in charge of the New York office, has been called back to headquarters at Cleveland, to handle special sales assignments.

A. W. MACE, formerly assistant to vice-president E. P. Thomas of the United States Steel Corporation, New York, has been appointed assistant to the president of the Ludlum Steel Co., Watervliet, N. Y., and will supervise the administration of the Iron and Steel Industry Code throughout the Ludlum organization.

SUNDSTRAND MACHINE TOOL CO., Rockford, Ill., has appointed R. LEWIS GIEBEL, 1501 Undercliff Ave., Bronx, New York City, exclusive representative in the New York territory for the complete line of Sundstrand machine tools.

TOLHURST MACHINE WORKS, INC., Troy, N. Y., has announced that the company has restored the salary reduction of 20 per cent which has been in effect in the organization since the early part of this year.

Pennsylvania

JAMES W. OWENS has been appointed consulting engineer and director of the new welding division of the Pittsburgh Testing Laboratory, a division to be known as the National Weld Testing Bureau. Mr. Owens has had wide experience in the welding field, covering a period of fifteen years. For eight years he was welding aide in charge of welding research and development for the Bureau of Construction and Repair of the U. S. Navy, and for four and a half years, he was director of welding at the Newport News Ship Building and Dry Dock Co. He was a member of the

Emergency Fleet Welding Committee during the World War and was one of the organizers of the American Welding Society, its vice-president from 1920 to 1922, and the recipient of the Miller Memorial Medal in 1929. In 1928, he was awarded the first prize of $10,000 in the Lincoln Co.'s international competition, sponsored by the American Society of Mechanical Engineers. He is a member of numerous engineering societies and acts on many technical committees.

PITTSBURGH TESTING LABORATORY, Pittsburgh, Pa., announces a new service for manufacturers, fabricators and contractors in the welding field, known as the National Weld Testing Bureau, which is prepared to render several distinct types of services: Reports on welding processes, reports on weld specimens prior to construction, and similar reports made during construction, laboratory tests of weld specimens, inspection of welded products and structures, and investigations of special welding problems. The Bureau will be in a position to assist manufacturers, fabricators, and contractors to comply with such specifications, codes, or rules as may have been adopted.

BRIDGEPORT SAFETY EMERY WHEEL CO., INC., 1283 W. Broad St., Bridgeport, Conn., has appointed THOMAS M. REES, 18 Fancourt St., Pittsburgh, Pa., representative for the company's line of grinding machinery in the Pittsburgh district. Mr. Rees has been engaged in the sale of machine tools for many years, having formerly been with the Motch & Merryweather Machinery Co., and later with the Pittsburgh office of Manning, Maxwell & Moore, Inc., and the Arch Machinery Co.

HOMESTEAD VALVE MFG. CO., INC., Coraopolis, Pa., has appointed REEVES-MCCORMICK, INC., 5317 N. Second St., Philadelphia, Pa., exclusive representative in the Philadelphia district for the sale of the company's "Hypressure Jenny," a vapor spray machine used for automotive, industrial, aeronautical, and building cleaning. F. J. Evans Engineering Co., 1305 Watts Bldg., Birmingham, Ala., has been appointed exclusive representative in the state of Alabama.

SELAS CO., 18th St. and Indiana Ave., Philadelphia, Pa., manufacturer of industrial gas heating equipment, has recently expanded its business to include the design and construction of special automatic machinery for all types of industrial heating processes. P. R. HOOPES, well-known consulting engineer, has been retained as technical consultant on this work.

PENROSE R. HOOPES, consulting mechanical engineer, who for the last twelve years has maintained offices in Hartford, Conn., has transferred his business to Philadelphia, and is now located at 18th St. and Indiana Ave. in that city. Mr. Hoopes specializes in the design of automatic machinery and mechanical products.

L. H. GILMER CO., Tacony, Philadelphia, Pa., held its annual employes' picnic Saturday, August 5, at the Columbus Country Club, Eddington, Pa., when seven hundred people were present as the company's guests. John S. Krauss, president of the Gilmer company, made a brief address of appreciation to the employes.

NEW BOOKS

THE IRREPRESSIBLE CONFLICT—BUSINESS VERSUS FINANCE. By David Cushman Coyle. 45 pages, 5 1/2 by 8 1/2 inches. Published by the author, 101 Park Ave., New York City. Price, single copies, 60 cents; two or more copies, 50 cents each; ten or more copies, 40 cents each.

This is the third edition of a little book that deals with the causes of business depressions and outlines some of the adjustments that may be required to meet the new conditions of industry. It emphasizes the need for economic planning with particular reference to the distribution of income and the allocation of income between equipment and consumption. In his concluding section, entitled "The Dawn of Civilization," Mr. Coyle draws an inspiring picture of the possibilities for a new order in which life will be enriched for mankind as a whole. Every man engaged in business or industry will find the time required to read this little book well spent.

THE OLDER EMPLOYE IN INDUSTRY. 25 pages, 7 3/4 by 10 3/4 inches. Published by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York City.

This booklet presents the findings of a survey covering 5000 manufacturers, which summarizes the plans of 800 of these for dealing with the problem of the older employe.

"TIN-FREE" LEADED BEARING BRONZE. By H. K. Herschman and J. L. Basil. 18 pages, 6 by 9 inches. Published by the U. S. Department of Commerce, Washington, D. C., as Research Paper No. 551 of the Bureau of Standards. Price, 5 cents.

A YEARBOOK OF RAILROAD INFORMATION (1933 Edition). 96 pages, 4 by 6 inches. Published by the Committee on Public Relations of the Eastern Railroads, 143 Liberty St., New York City.

OBITUARIES

F. F. WOODS, of 207 Fulton Bldg., Pittsburgh, Pa., factory representative of Roots-Connersville-Wilbraham, Connersville, Ind., died at his home on August 3, after an illness of several weeks duration.

Before becoming associated with the R-C-W organization, Mr. Woods represented the Hayton Pump & Blower Co., Appleton, Wis. When the industrial pump business of this firm was moved to Connersville several years ago, and T. R. Hayton, who had founded the company, located there as engineer of the R-C-W centrifugal pump division, Mr. Woods was appointed district manager of the Pittsburgh area, continuing the sale of Hayton centrifugal pumps along with other R-C-W products.

FRANK W. PEEK, JR., chief engineer of the Pittsfield, Mass., Works of the General Electric Co., Schenectady, N. Y., and one of the company's specialists in high-voltage work, was killed on July 26 when his automobile was struck by a train near Gascones on the Gasp Peninsula of Canada. Mr. Peek was born at Mokelumne Hill, Calif., in 1884. He graduated from Leland-Stanford University in 1905 with the degree of Bachelor of Arts and received the degree of Master of Electrical Engineering at Union College in 1911. He became an employe of the General Electric Co. in 1905, and was a recognized authority on the subject of lightning protection for both buildings and electric systems.

COMING EVENTS

SEPTEMBER 15-16—Annual convention of the NATIONAL ASSOCIATION OF FOREMEN at Akron, Ohio. Secretary, E. H. Tingley, Refiners Bldg., Dayton, Ohio.

OCTOBER 2-6—NATIONAL METAL CONGRESS AND EXPOSITION in Detroit, Mich., under the auspices of the American Society for Steel Treating. Secretary, W. H. Eisenman, 7016 Euclid Ave., Cleveland, Ohio.

OCTOBER 2-6—Twenty-second annual Safety Congress and Safety Exhibition at the Stevens Hotel, Chicago, Ill. For further information address National Safety Council, Inc., 20 N. Wacker Drive, Chicago, Ill.

Classified Contents of this Number

Your Progress Depends Upon Your Knowledge of Your Industry

NEWS OF THE INDUSTRY

California

CHAIN BELT CO., Milwaukee, Wis., has appointed the H. C. WOOD MACHINERY WORKS, 514 Bryant St., San Francisco, Calif., and the BROWN-BEVIS EQUIPMENT CO., Los Angeles, Calif., (successor to the BROWN-BEVIS CO.), distributors for the Construction Equipment Division of the company.

Illinois, Missouri, and Wisconsin

YALE & TOWNE MFG. CO., Chrysler Bldg., 405 Lexington Ave., New York City, announces the purchase of the real estate, machinery, tools, inventory, patents, and good will of the WALKER VEHICLE CO. and the AUTOMATIC TRANSPORTATION CO., of Chicago, manufacturers of industrial electric trucks and commercial electric street vehicles. The Yale & Towne Mfg. Co. will continue the manufacture and sale of the complete line of each company at 101 W. 87th St., Chicago, retaining the present personnel, with F. H. Tinsley in charge.

LANDIS TOOL CO., Waynesboro, Pa., is conducting an exhibit and demonstration at the show room connected with the company's Chicago office, 618 W. Washington Blvd. Two recently developed Landis grinders are demonstrated under power, one of which is equipped with the new Landis air sizing device. Included in the exhibit is a display of typical parts ground on Landis machines.

GEORGE L. BRADLEY CO., Rockford, Ill., is a new sales agency organized by George L. Bradley, who was formerly connected with the Sales Department of the Ingersoll Milling Machine Co., Rockford, Ill. The new company will represent the Davis & Thompson Co., the Rehnberg-Jacobson Mfg. Co., and the Rockford Machine Tool Co.

CHAIN BELT CO., Milwaukee, Wis., has moved its St. Louis office from 339 N. Taylor Ave. to 5475 Cabanne Ave. The St. Louis branch has been operating under the direction of FITCH S. BOSWORTH since the first of the year. The territory under the supervision of this office consists of the southern half of Illinois, the eastern half of Missouri, and the southwestern corner of Iowa.

CHAIN BELT CO., Milwaukee, Wis., writes us that the company has received orders for, and is building, twenty-one specially designed Rex Moto-Mixers, twenty-eight Rex-Stearns belt conveyors, and a Rex super-size mixer for the construction of the San Francisco-Oakland Bridge which, when completed, will be the longest in the world, and is one of the outstanding engineering undertakings of all times.

Massachusetts

DR. JEROME CLARKE HUNSAKER, vice-president of the Goodyear Zeppelin Corporation and internationally known for his contributions to aeronautical engineering, has been appointed head of the department of mechanical engineering of the Massachusetts Institute of Technology, succeeding the late PROFESSOR EDWARD F. MILLER, for many years head of the department. Dr. Hunsaker graduated from the United States Naval Academy in 1908; and, after an advance course of study at the Massachusetts Institute of Technology, he was, in 1912, awarded the degree of Master of Science, and in 1916 the degree of Doctor of Science. The design of the airship *Shenandoah* was prepared under Dr. Hunsaker's direction. He resigned from the Navy in 1926, and has later been engaged with the American Telephone & Telegraph Co., and the Goodyear Zeppelin Corporation, for which organization he will continue to act in the capacity of consulting engineer on airships.

COPPUS ENGINEERING CORPORATION, Worcester, Mass., manufacturer of blowers and steam turbines, has appointed John O. Weber, 122 Main St., Louisville, Ky., representative for the state of Kentucky, with the exclusion of a few counties which are served from the Cincinnati office. Mr. Weber will handle the entire Coppus line of forced-draft and ventilating blowers, cooling fans, steam turbines, and turbo-generators.

Michigan

WHITMAN & BARNES, INC., manufacturers of twist drills, reamers, cutters, punches, and other tools, established in 1854 and having factories in Detroit, Mich., and Walkerville, Ontario, announce the acquisition of three subsidiaries—the LATROBE TOOL MFG. CO., Latrobe, Pa., manufacturer of drills and reamers, the J. M. CARPENTER TAP & DIE CO., Pawtucket, R. I., manufacturer of taps, dies, and screw plates, and the VALLEY FORGE STEEL & TOOL CO., Chicago, Ill., a tool-distributing organization dealing chiefly in twist drills, reamers, taps, and dies. No consolidation of the manufacturing and sales organizations of the four companies is contemplated. CLARENCE AVILDSEN has been elected chairman of the board of directors; M. J. KEARINS has been elected president, succeeding WILLIAM H. EAGER who retires as an active officer, although remaining on the board of directors; EARL F. REINHART and ERIK ANDERSEN have been elected vice-president and treasurer, respectively, succeeding KARL KENDIG, who also retires as an active officer, although remaining on the board of directors. HARRY J. COGSWELL continues as president of the Valley Forge Steel & Tool Co.

New York

F. W. ALTORFER has been appointed eastern district sales manager for the National Acme Co., with headquarters in New York City. WILLARD A. JOHNSON, for some years in charge of the New York office, has been called back to headquarters at Cleveland, to handle special sales assignments.

A. W. MACE, formerly assistant to vice-president E. P. Thomas of the United States Steel Corporation, New York, has been appointed assistant to the president of the Ludlum Steel Co., Watervliet, N. Y., and will supervise the administration of the Iron and Steel Industry Code throughout the Ludlum organization.

SUNDSTRAND MACHINE TOOL CO., Rockford, Ill., has appointed R. LEWIS GIEBEL, 1501 Undercliff Ave., Bronx, New York City, exclusive representative in the New York territory for the complete line of Sundstrand machine tools.

TOLHURST MACHINE WORKS, INC., Troy, N. Y., has announced that the company has restored the salary reduction of 20 per cent which has been in effect in the organization since the early part of this year.

Pennsylvania

JAMES W. OWENS has been appointed consulting engineer and director of the new welding division of the Pittsburgh Testing Laboratory, a division to be known as the National Weld Testing Bureau. Mr. Owens has had wide experience in the welding field, covering a period of fifteen years. For eight years he was welding aide in charge of welding research and development for the Bureau of Construction and Repair of the U. S. Navy, and for four and a half years, he was director of welding at the Newport News Ship Building and Dry Dock Co. He was a member of the